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CONTENTS.

Page.

THE SKATES AND RAYS OF CALIFORNIA WITH AN ACCOUNT OF THE RAT FISH.....*E. C. Starks* 1

THE QUINNAT SALMON IN NEW ZEALAND.....*N. B. Scofield* 16

BIGHORN SHEEP IN THE VICINITY OF CLAREMONT, CALIFORNIA .....*L. L. Gardner* 17

DEER LICKS OF THE TRINITY NATIONAL FOREST GAME REFUGE .....*H. C. Bryant* 21

UNAPPRECIATED FRIENDS.....*J. G. Tyler* 26

EDITORIALS 30

HATCHERY NOTES 45

COMMERCIAL FISHERY NOTES..... 49

LIFE HISTORY NOTES..... 50

REPORTS—

Fishery Products, July to September, 1917..... 52

Violations of Fish and Game Laws..... 54

Seizures 55

Financial Report 56

THE SKATES AND RAYS OF CALIFORNIA, WITH AN ACCOUNT OF THE RAT FISH.*

By Edwin Chapin Starks.

This account of the skates and rays of California may be considered a continuation of the account of the sharks† that appeared in the last number of this journal, for the skates and rays are closed related to the sharks, and may be regarded as an offshoot developed from them. The appearance of the skates on the earth was much later than that

*This is the second of a series of articles the first of which was entitled "The Sharks of California." Attention is called to still another shark, commonly called the bonito shark (*Isuropsis glauca*), which should be included among the sharks of our coast. It resembles the mackerel shark and the great white shark in having a projecting keel on each side of the tail. It may be known from the white shark by the smooth-edged teeth, and from the mackerel shark by the first dorsal being behind the pectorals instead of almost directly over them. It is more slender than the mackerel shark. A specimen thirteen feet in length was taken at Santa Catalina Island a few years ago, where small ones are reported by the late C. F. Holden to be common. It is otherwise known from Japan and the Hawaiian Islands.

†The author wishes to also call attention to a mistake made in printing the article on sharks that appeared in the last number of CALIFORNIA FISH AND GAME. The first three lines on page 153 should be below the next six lines instead of above them. In the copies of the article that were separately printed the mistake was corrected.

of the sharks, fossils of which are known back almost to the first of the animals with a backbone.

Though the typical sharks and the typical skates do not look at all alike, we have sharks that do look very much like the skates, such as the angel-shark; and skates, on the other hand, that are rather shark-like. The character that may be most readily used to separate them is the position of the gill slits. In the sharks the gill slits are on the side of the body; sometimes extending down on the lower surface, but the upper end is always on the side. The skates and rays have the gill slits altogether on the lower surface of the body. There are several other characters that separate the sharks from the skates and rays, but they are internal and need not be considered here.

The skates and rays are specialized for life on the sea bottom. They are not swift swimming fishes like the sharks that feed on other fishes, but they depend on crabs and clams and such forms of animal life for their food. The body by the development of the pectoral fins, which extend forward along the side of the head, is flattened and disk-like. The caudal fin may, or may not, be present. When it is not the tail is more or less whip-like. None of them have an anal fin, and in many the dorsals are also absent. When present the dorsals are far back on the

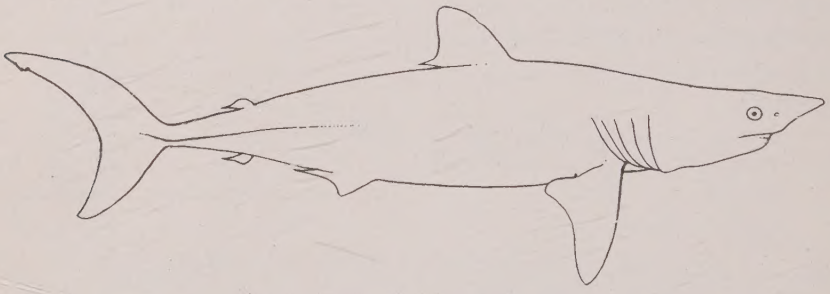

Fig. 1. Bonito shark. *Isuropsis glauca.*

body or tail. The teeth may be in the form of a pavement, sometimes being perfectly flat for crushing, or they may be with fine points. The spiracle, which in the sharks is a small pore behind the eye, or else is entirely absent, is in the skates and rays a large opening through which water is introduced to the gills for breathing purposes. This avoids the introduction of sand or sediment into the gill chamber as would probably happen did they take water through the mouth (as the sharks do) when they lie flat on the sea bottom.

The skates like the sharks have claspers in the male. These in the young extend scarcely past the ventral fins, but in the adult they develop to a large size (see figs. 5, young, and 10 and 11, adult).

I have changed the form of this paper from that on the sharks by giving first a description of the different families of the skates and rays. This saves repeating all of the characters under each species. Hence in identifying any fish of this group it will be necessary to first find its family.

FAMILIES OF CALIFORNIA SKATES AND RAYS.

Caudal fin developed. Tail thick and with two dorsal fins on top of it. Ventral fins not notched on outer edge‡ (see fig. 6 for notched ventrals). Skin rough with scattered spines. Color not uniformly black.

1. The Guitar Fishes (*family Rhinobatidæ*). Page 4.

Caudal fin developed. Tail thick and with two dorsal fins on top of it. Ventral fins not notched on outer edge‡ (see fig. 6 for notched ventrals). Skin everywhere perfectly smooth. Color uniformly black.

2. The Electric Rays (*family Narcobatidæ*). Page 6.

Caudal fin absent, or represented only by a slight fold of skin. Two dorsal fins crowded together near tip of tail. Ventral fins notched on outer edge (as in fig. 6). Skin rough with scattered spines.

3. The Skates (*family Rajidæ*). Page 7.

Tail slender, often whip-like. No dorsal fin. Caudal fin present or absent. Back of tail with a long spine or sting (sometimes duplicated, occasionally absent.) Eyes not at edge of head.

4. The Sting Rays (*family Dasyatidæ*). Page 11.

Tail whip-like, without caudal fin. A single dorsal fin just in front of sting. Sting often duplicated. Eyes at edge of head. Teeth large and flat, forming a tile-like pavement.

5. The Eagle Rays (*family Ætobatidæ*). Page 13.

Tail whip-like, without caudal fin. A single dorsal fin opposite ventral fins. Sting behind dorsal or absent. Eyes at edge of head. Teeth small and numerous. Head with a pair of horn-like arms just under the front of it. Size enormous.

6. The Sea-Devils (*family Mantidæ*). Page 13.

GLOSSARY.

The names of the fins may be learned from fig. 2.

Claspers. Rod-like organs, one attached to the inner edge of each ventral fin in the male. Not projecting beyond the fin in the young.

Disk. The flattened part of the body made by the projecting pectoral and ventral fins.

Rostral ridges. The ridges running forward from in front of the eyes to the tip of the snout.

Shagreen. The skin when it feels like fine sandpaper.

Snout. The part lying directly in front of the eyes.

Spiracle. The hole just behind the eye.

‡Do not mistake the notch formed by the presence of a clasper in the male for a notched fin.

1. THE GUITAR FISHES

(*Family Rhinobatidæ*).

The Guitar Fish (Rhinobatus productus).

This is often called shovelnosed shark, especially on the southern coast. This name should be discouraged, as it is not a shark, and as we already have a shark (*Hexanchus*) known by this name.

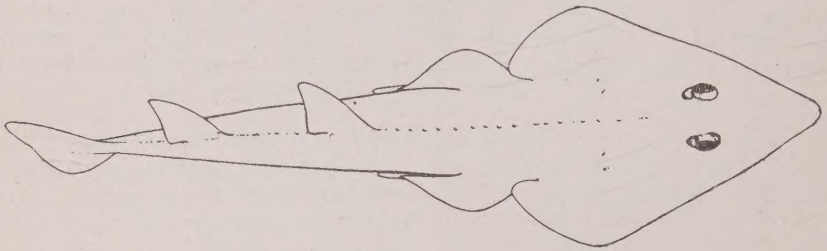

Fig. 2. The guitar fish *Rhinobatus productus*. Adult male.

The guitar fish is not much expanded and disk-like, being sharply wedge-shaped in front and tapering into a thick tail behind. Two dorsal fins and a caudal fin are well developed. The body is covered with shagreen and there are rows of hooked spines along the middle line of the back and tail, and a small bunch at the shoulder. The young fish has small spines around the inner border of the eye and along the rostral ridges. The color is uniform dull brownish on the upper surface and white on the lower.

This fish is found from San Francisco to San Diego and southward. South of Point Concepcion it is very common. It reaches a length of 3 or 4 feet.

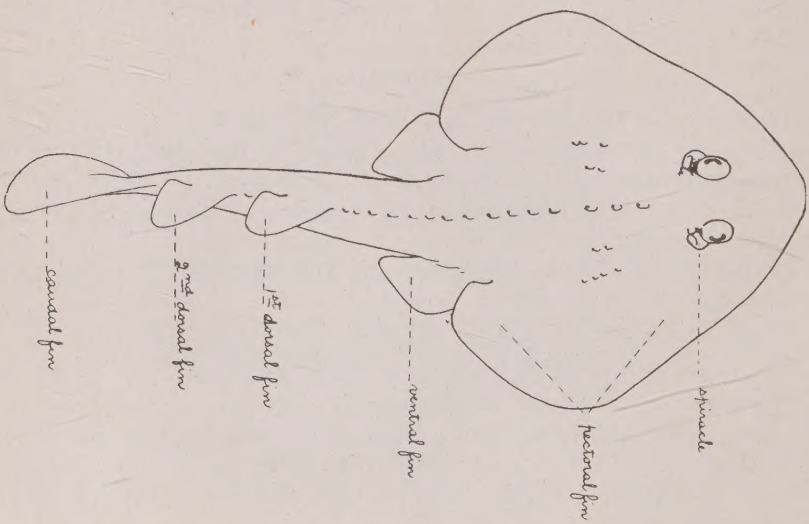

Fig 3. The prickly skate *Zapteryx exasperatus*. Young female.

The Prickly Skate (Zapteryx exasperatus).

The front margins of the disk are undulating and together form an angle less than a right angle. The snout is prominent but blunt at the tip. The front of the first dorsal fin is only a little behind the hind edge of the ventral fins. The upper surface of the body is covered with close-set prickles of different sizes, rather than shagreen as in the next species. There is a row of enlarged spines along the middle of the back and the tail, and 2 short rows on each shoulder of 2 or 3 spines each. There are no spines on the sides of the tail. The color is grayish brown with indications of clouded crossbars. There is a large black blotch on the lower surface of the pectoral at its hind end.

This species has been recorded only from southern California, being scarcely known outside of the bay of San Diego. Nearly 38 years ago, when this fish was first described, males were reported to be abundant in San Diego Bay. No female has ever been recorded until now. Recently I was loaned two young specimens by Dr. Ritter of the Scripps Laboratory at La Jolla, one of which was a female. Aside from the absence of claspers, it is identical in all of its characters with the male. It is $7\frac{1}{2}$ inches long and is the specimen here figured. This species reaches a length of nearly 3 feet, and appears to be very rare.

The Round Skate (Platyrhinoidis triseriatus).

This species may be known from the other members of its family by the disk being rounded in front; the curve being unbroken by the snout. The front of the first dorsal fin is nearer to the beginning of the caudal fin than it is to the point where the ventral fin joins the body. Both surfaces of the body are covered with shagreen. Coarse prickles follow

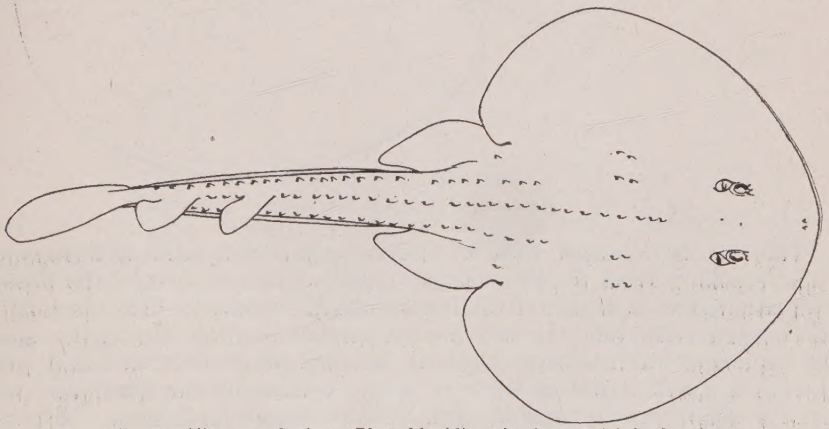

Fig. 4. The round skate *Platyrhinoidis triseriatus.* Adult female.

the front margin of the pectorals. There is a small bunch of spines at the tip of the snout, and a few around the inner margin of the eye. A long series of spines follows the middle line of the back and tail, and a row at each side of it on the tail. There are 2 small bunches of spines on each shoulder of 1 or 2 spines each. It is grayish brown in color.

This species reaches a length of 2 feet, and is found in some abundance in the bays on the coast below Point Concepcion. It has been taken once or twice as far north as San Francisco.

2. THE ELECTRIC RAYS

(Family Narcobatidæ).

The Electric Ray (Tetronarce californica).

This is the only member of its family on our coast, and may be recognized by its broad circular disk, covered with smooth black skin without spines or prickles anywhere, and by its well-developed caudal fin and two dorsal fins. The eyes are very small, and the small mouth is provided with fine sharp teeth. It is blue-black, or dark lead color, above and white on the lower parts.

The electric ray is said to reach a length of 3 feet, though it is seldom seen much over a foot in length. It is known from central California southward to the Santa Barbara Channel, being rather common in deep water in Monterey Bay.

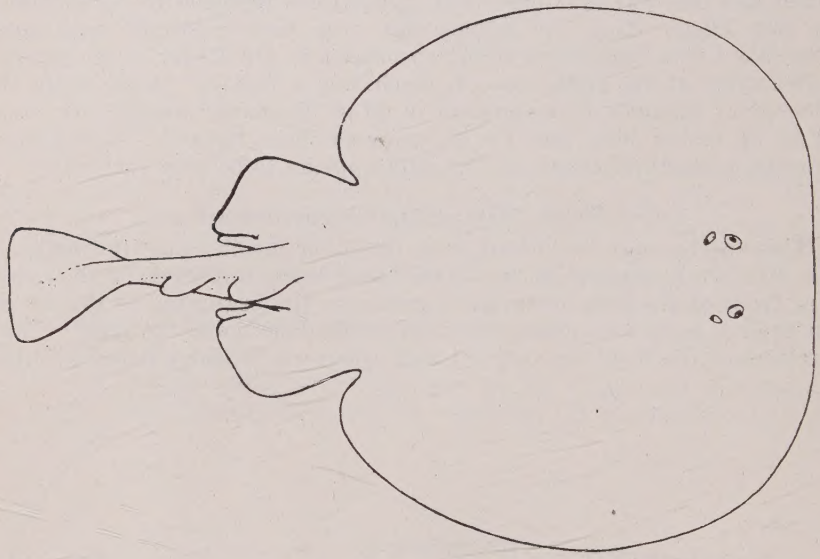

Fig. 5. The electric ray *Tetronarce californica.* Young male.

This ray is provided with an electric organ composed of hexagonal cells, reaching from the skin of the upper surface to that of the lower, and situated at each side of the head and gill chambers. The electricity discharged from this ray has the properties of other electricity, such as rendering an iron bar magnetic, decomposing chemicals, and producing a spark. Stories vary as to the volume of the discharge, but even a small ray is capable of inflicting considerable pain. After a few discharges the fish becomes exhausted and must rest before its electric organs are again functional. It is of interest to note that the first record we have of the application of electricity is of the time of Anthony and Cleopatra, whose court physician recommended the electricity of an electric ray for medical purposes, especially for pains in the head. Later it was prescribed for the cure of gout.

3. THE SKATES

(*Family Rajaidæ*).

The Long-nosed Skate (Raja rhina).

This skate may be known by the long projecting snout, making the front outline of the disk deeply concave. (Compare the straight line drawn from the tip of the snout to the outer pectoral angle, in its relation to the outline of the front of the disk, in the figure of this species with that of the next.) When the front edge of the ventral fin is held at a right angle with the tail its outer edge is concave as in fig. 7. The rostral ridges are grown together along their front half. Very small spines are scattered over the outer edges of the body and back behind the shoulders, but leaving large areas of smooth skin. Coarser

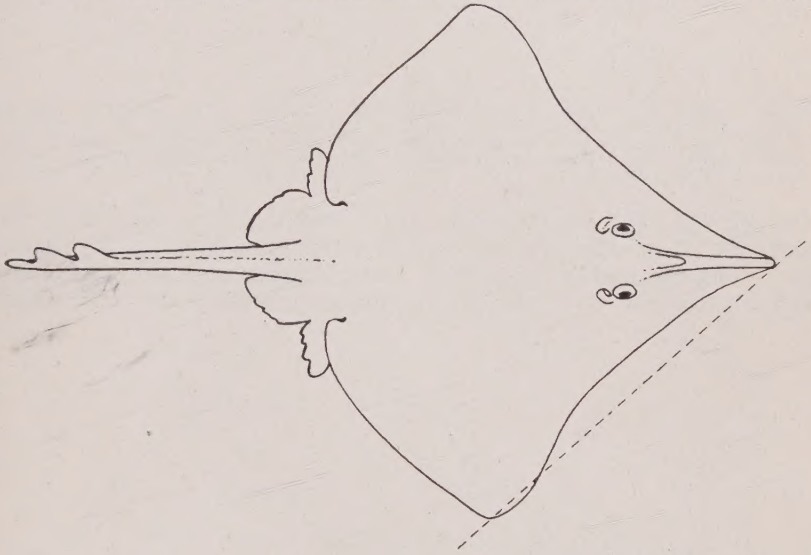

Fig. 6. The long-nosed skate *Raja rhina*. Adult female.

ones at front edge of body, snout, and between eyes. Enlarged spines around inner edge of eyes, along middle of back (usually absent in large specimens) and on back of tail. The male has a row of long, sharp spines near the outer angle of the body. The color is dark sienna-brown with irregular dark blotches sometimes present. There is a spot at the base of the pectoral in the form of an irregular ring, always present in the young and sometimes in the adult, but usually present as an indistinct spot. This is never wider than the space between the eyes.

This skate is found from the Gulf of California to Alaska, and on the California coast is common nearly everywhere. It reaches a length of $3\frac{1}{2}$ feet. The egg cases of this skate are 3 or 4 inches long, and usually contain only a single egg.

The Common California Skate (Raja inornata).

The snout in this skate is not so projecting as in the long-nosed skate. The region at each side of the snout is concave, as is the region toward the outer angle of the pectoral, while the region midway between these

points is convex. When a straight line is drawn from the snout to the outer angle of the pectoral the middle of the line nearly, or quite, touches the body. Ventral fins as described for the long-nosed skate

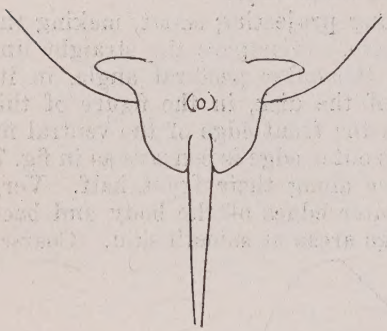

Fig. 7. Ventral fins of *Raja inornata,* showing the front edge of the ventral fin held at a right angle with the tail making the outer edge concave. Fig. 9 shows the fin notched as in normal position.

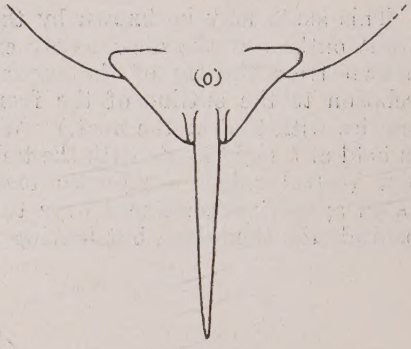

Fig. 8. Ventral fins of *Raja binoculata,* showing the front edge of the ventral fin held at a right angle with the tail, making the outer edge nearly straight. Fig. 10 shows fin concave as in normal position.

(see fig 7). The rostral ridges are grown together along their front half. Small prickles are scattered over the outer edges of the pectorals and along the middle line of the back. Larger ones are on the snout and between the eyes. Enlarged spines are around the inner edge of

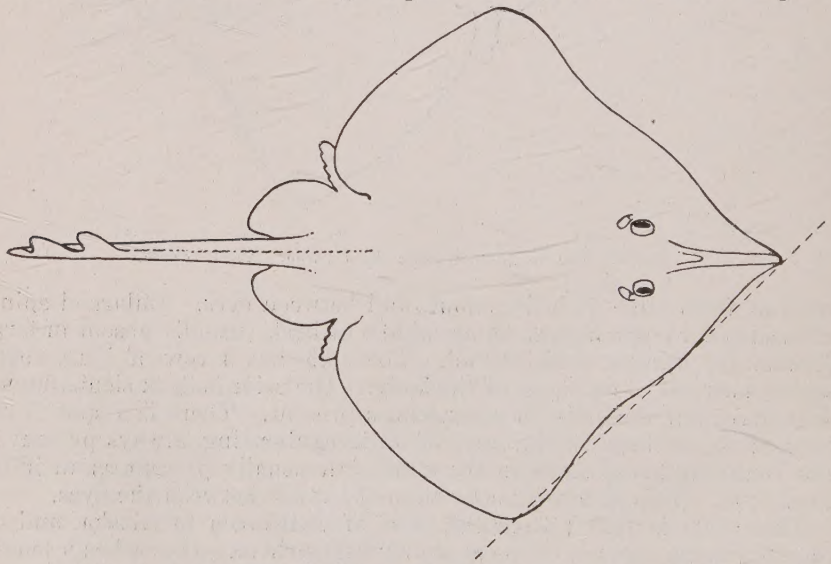

Fig. 9. The common California skate *Raja inornata.* Adult female.

the eye, and from 3 to 5 rows of them on the back of the tail. The color is dark brown, with usually a small ring composed of irregular spots at the base of the pectoral.

This skate is known from San Diego to San Francisco and somewhat northward, but has never been recorded beyond the California coast. It reaches a length of $2\frac{1}{2}$ feet.

The Big Skate (Raja binoculata).

This skate may be known from any others of its family by the shallow notch in the ventral fins. When the front edge of the ventral fin is held at a right angle with the tail, its outer edge is nearly straight, as in fig. 8. The rostral ridges are grown together along their front fourth only. The upper part of the body is everywhere covered with very small prickles, uniform in size, and as fine or finer than those that compose shagreen, but not nearly so closely placed. These are absent in the young. There are from 1 to 3 rows of irregular spines along the back of the tail. The color is dull olive brown, or drab, with a large dusky spot at the pectoral base blended into the body color. Light

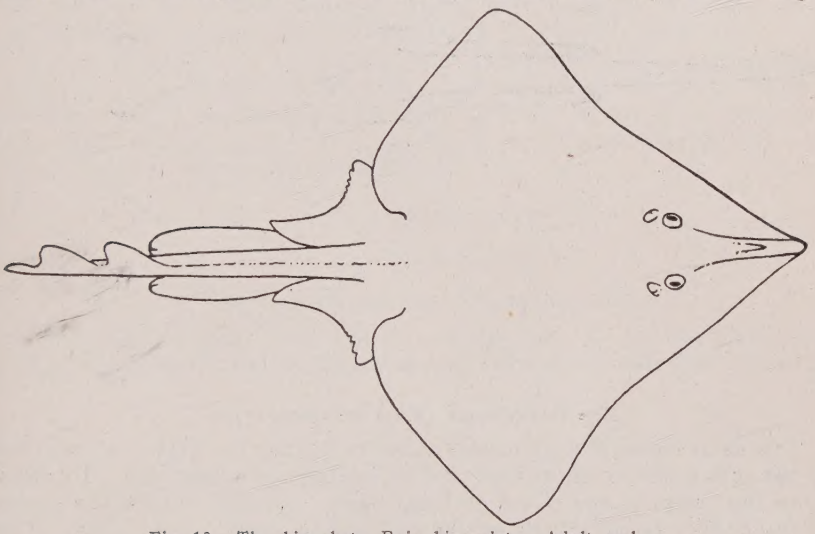

Fig. 10. The big skate *Raja binoculata.* Adult male.

spots as large as the eye are scattered over the body and form a ring around the pectoral spot. The diameter of the ring is always much greater than the space between the eyes.

This skate is common from Monterey Bay northward to Alaska. It reaches a length of over 6 feet. Its egg cases are nearly a foot in length, and each contains from one to six eggs or young.

The Starry Skate (Raja stellulata).

This skate may be known from others of its family by the almost entire absence of the rostral ridges, the rostral cartilages being very slender rods that can scarcely be detected. It also differs from all but the rock skate in having the body at each side of the snout convex instead of concave, and in having a straight line drawn from the tip of the snout to the outer pectoral angle, everywhere passing inside of the outline of the body. Small sharp prickles are scattered everywhere over the upper surface of the body, and a series of enlarged spines runs down the middle of the back and tail. The color is grayish brown with small dark spots scattered over the back. A large, irregular, yellow spot ringed with brown is sometimes just behind the middle of the body

on base of each pectoral; a smaller, round one, just inward from it, and a third one just outward from the eye. These spots are often absent.

This skate is found in rather deep water from southern California northward to Alaska. It reaches a length of $2\frac{1}{2}$ feet.

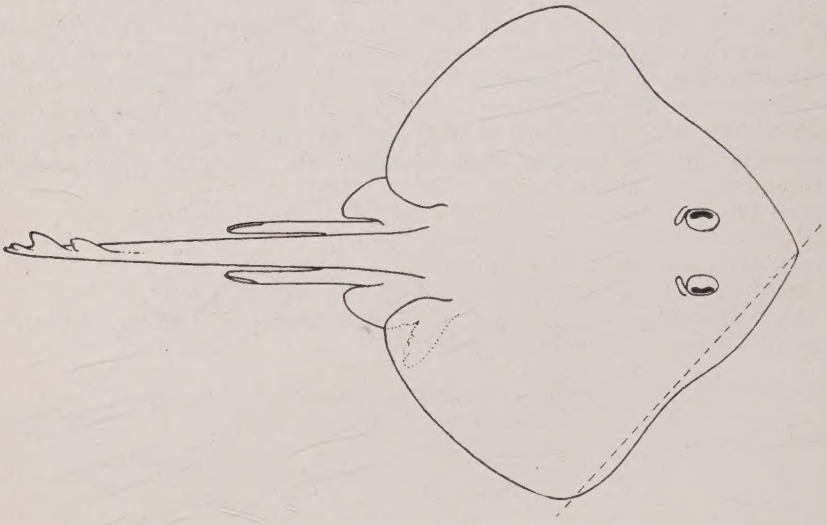

Fig. 11. The starry skate *Raja stellulata*. Adult male.

The Rock Skate (Raja montereyensis).

This skate resembles the starry skate in having the region at each side of the snout convex in outline, and in having a straight line (if drawn) from the snout to the outer pectoral angle included within the outline of the body. In all of the others such a line would pass outside of the outline. It may be known from the starry skate by the rostral ridges,

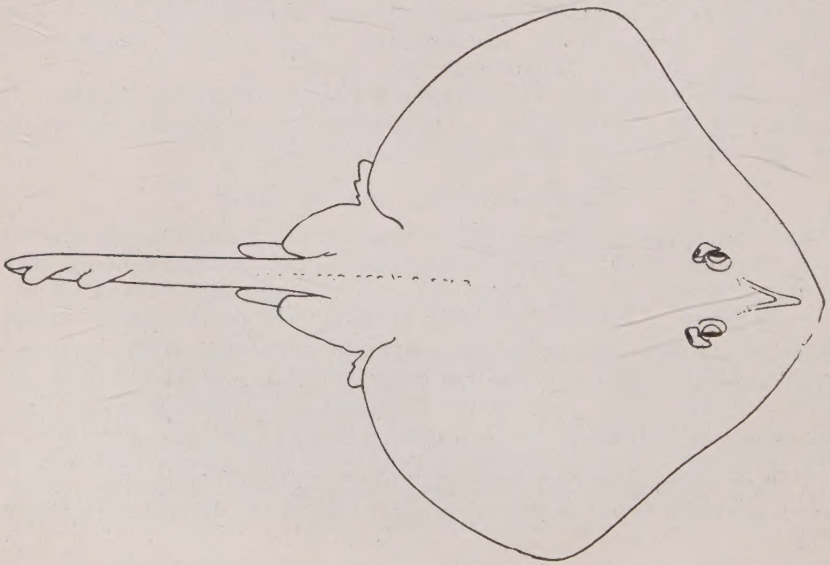

Fig. 12. The rock skate *Raja montereyensis*. Adult male.

which are strong and well developed as in the other skates. The rostral ridges meet close to their tips. The upper surface is everywhere covered with prickles, which are coarsest and most numerous on the middle of the back and between the eyes. A band of larger spines follows the front outline of the body. Two or three enlarged spines are around the inner edge of the eye, or they may be absent in large specimens. A row of enlarged spines follows down the middle line of the back and tail, and may be present on each side of the tail. The region in front of the mouth is rough on the under side of the body. The color is slaty brown with some darker mottlings. Small dark spots make irregular bars across the space between the eyes. A dark spot surrounded by a broken ring of small spots occupies the base of the pectorals. A short distance behind this is a small white spot.

Little is known as to the distribution of this skate, as it has only recently been recognized by science, though it seems to be known to fishermen, who pronounce it the best table fish of all of the skates. It does not reach a large size. The only specimens known have been taken in deep water off Santa Cruz.

4. THE STING RAYS*

(*Family Dasyatidæ*).

The Round Sting Ray (Urolophus halleri).

This is sometimes called the little sting ray. It may be known from other members of its family by the tail being shorter than the rest of

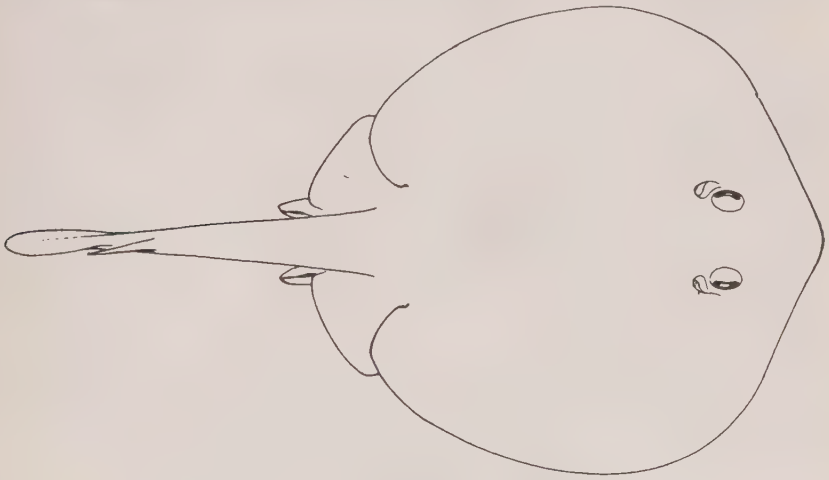

Fig. 13. The round sting ray *Urolophus halleri*. Adult male.

the body, and the width of the body being less than the entire length. The outline of the disk is circular, and the skin is smooth or without spines. A narrow, long caudal fin is present, but no dorsal fin. The color is dark brown or slaty brown above, and is usually with lighter

*Should a person be so unfortunate as to be stung by one of these rays, he will appreciate the advice to hold the wounded part in hot water. This will usually take the pain away immediately for as long as the treatment is continued, and the patient will be very ready to continue it, even for several hours, to escape the almost unbearable pain. The wound should, of course, be disinfected.

spots, but not always. The spots may be clear cut and separated, or blended and more or less run together.

This is the smallest of our sting rays, but its numbers and activity make it one of the most dreaded by bathers. It scarcely exceeds a foot in length, and is found on the coast south of Point Concepcion and southward to Panama. In sheltered bays on shallow sand or mud flats it occurs in almost countless numbers.

The Rat-Tailed Sting Ray (Dasyatis dipterura).

This is known from other sting rays of California by its long whip-like tail, longer than the rest of the body, and in addition the eyes are on top of the head, not near the edge of the disk. There is no dorsal or caudal fin, but the tail is provided with a long vertical fold of skin above and below. The outline of the disk is somewhat circular, though the front edges are nearly straight and meet at a slight angle at the snout. The skin is very slightly rough to the touch, and large specimens have a row of enlarged spines along the middle of the back, and a couple of spines at the shoulder. The color is plain bluish brown without spots.

This ray is found in southern California and is rather abundant in San Diego Bay. It reaches a length of 6 feet.

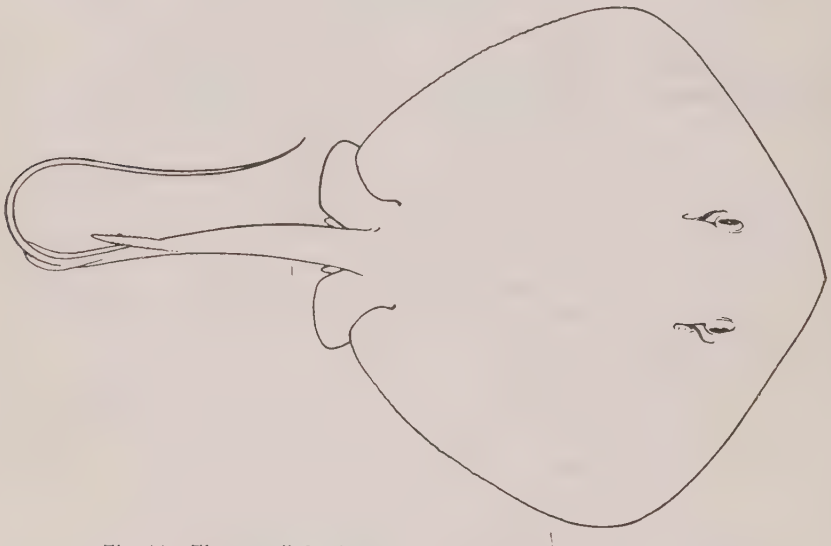

Fig. 14. The rat-tailed sting ray *Dasyatis dipterura*. Young male.

The Butterfly Sting Ray (Pteroplatea marmorata).

This may be known from all other skates and rays by the great width of the disk and the very short tail. It is very much wider than the entire length of the body and tail. The tail is flattened and has a slight fold of skin above and below, but no dorsal or caudal fin is developed. The skin is perfectly smooth and no spines or prickles are developed anywhere. The sting is very small or frequently absent. It is dark brown in color and mottled with small light drab spots and short irregular lines formed by spots running together.

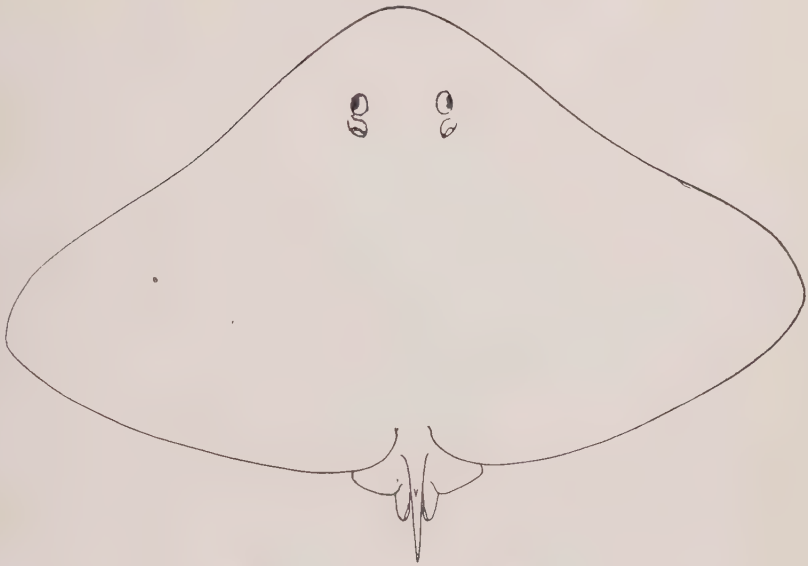

Fig. 15. The butterfly sting ray *Pteroplatea marmorata*. Adult male.

This ray is common south of Point Concepcion, frequenting the shallow tide flats of sheltered bays. It reaches a width of 4½ feet. Its sting is short and the small movement it is able to give its tail makes it one of the least dangerous of the sting rays.

5. THE EAGLE RAYS

(*Family Ætobatidæ*).

The Bat Fish or Eagle Ray, Sometimes Called California Sting Ray (Myliobatis californicus).

This is the only representative of its family on our coast. The head stands above the disk at each side, and the eyes are on the side of the head close to the edge of the disk. The pectorals fins are sharp at the outer angles, and a single dorsal fin is present just in front of the sting. The tail is long, slender, and whip-like. The skin is perfectly smooth without spines or prickles. The teeth are flat and pavement-like, resembling a tile floor. It is a uniform dark slate color above and white below.

This sting ray reaches a length of 3 feet and is common south of San Francisco. It is very destructive to oysters, crushing them between its wide flat teeth. Its depredations in this way have caused the owners of oyster beds in California to protect their property by fences of closely set poles driven into the mud around the beds.

6. THE SEA DEVILS

(*Family Mantidæ*).

The Sea Devil (Manta birostris).

This is a gigantic ray that may be known at once by a pair of projecting arms from under the front part of the head. The body is shaped much as in the bat fish (*Myliobatus*) with a long whip-like tail and a single dorsal fin. The teeth are small and in many series.

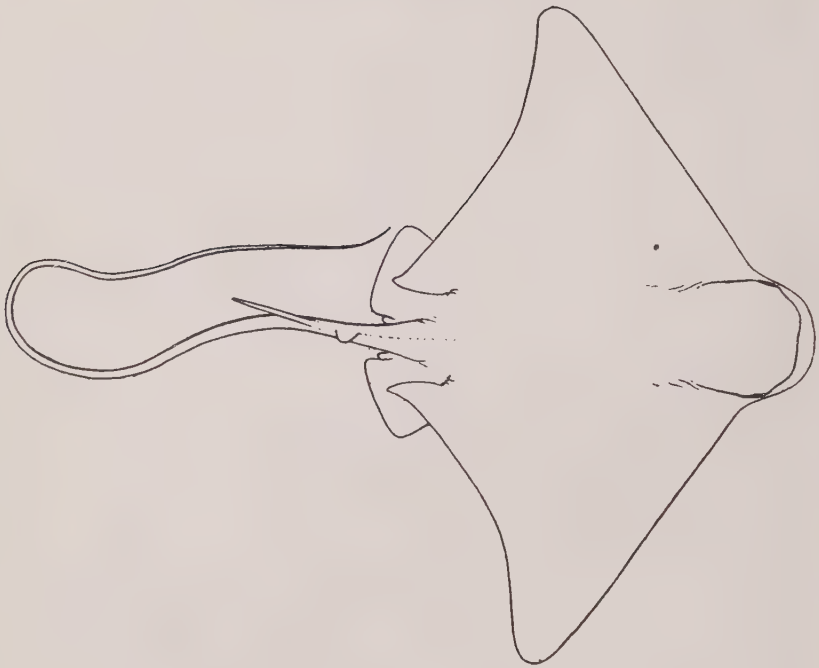

Fig. 16. The eagle ray *Myliobatis californicus.* Young male.

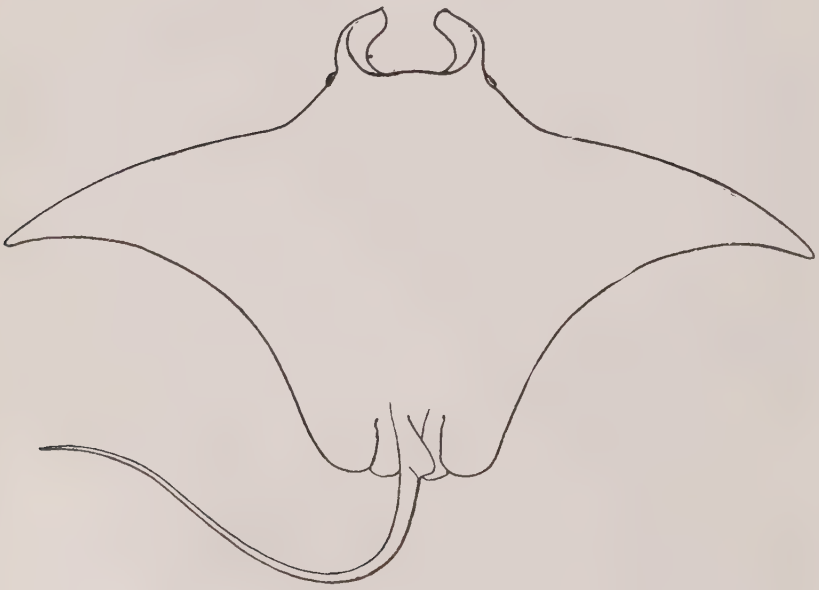

Fig. 17. The sea devil *Manta birostris.* Adult female.

This giant ray has been seen in our region only by fishermen, who have reported an immense ray off the coast of San Diego. It is known from tropical American waters, and is not uncommon on West Indian and Florida coasts. It reaches a length of 20 feet.

THE CHIMÆRAS.

The group that includes the sharks and skates is usually subdivided into two groups. The sharks and skates form one group and the chimæras the other. Little as the chimæras resemble the sharks their relationship is distinctly with them as is shown by their anatomy and development. We have on our California coast one representative of this group.

The Chimæra or Rat Fish

(*Chimæra colliei*).

The gills have only one external opening as in the majority of fishes. The skeleton is of cartilage. The skin is thin, smooth, and scaleless. The body is robust in the forward part, but tapers behind into a long tail ending in a fine point. The mouth is small under a blunt projecting snout, and is armed by thin plates formed by the united teeth. The first dorsal fin is triangular and has a long, sharp spine at its front edge,

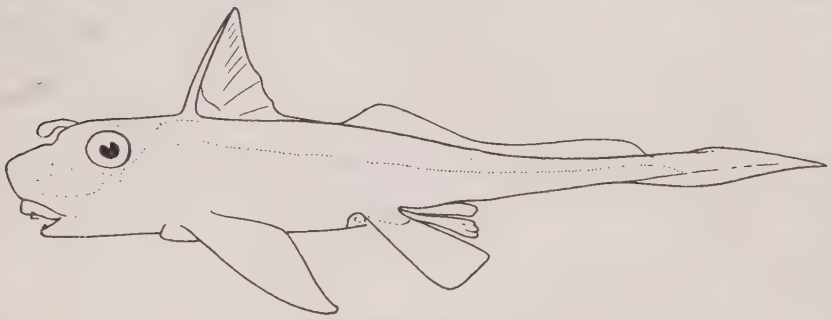

Fig. 18. The chimæra or rat fish *Chimæra colliei*. Adult male.

while the second dorsal is long and low with a wide rounded notch at its middle that nearly divides it into two parts. The caudal fin is narrow, with the tail projecting from it in a point. The anal is absent and the pectorals are long and wing-shaped. A series of channels and pores forms a crooked line along the side and branches over the head. The male has several appendages that are absent in the female. One is club-shaped, curving downward on the forehead, and is armed with sharp spines; one protrudes from a sheath of skin in front of each ventral fin; and behind each ventral is a pair of claspers. The color, when the fish is alive, is silvery but reflecting golden metallic hues, and pale green, rose color and blue. The pupil is a beautiful pale greenish blue. Out of the water its brilliant colors soon fade.

This peculiar fish is common along our entire coast, but as we go southward it is found in deeper and deeper water. In Puget Sound and northward it is taken in very shallow water. In Monterey Bay, though it is sometimes taken in shallow water, it is commonest in fifty or more fathoms. Below Point Concepcion it is never found in shallow water. It reaches a length of nearly $2\frac{1}{2}$ feet.

THE QUINNAT SALMON IN NEW ZEALAND.

By N. B. Scofield.

During the last twenty or more years, efforts have been made to introduce the quinnat salmon of California into the waters of New Zealand. The method of introduction has been to take the salmon eggs from the hatcheries in this state, at a time when they have developed to such an extent that the eyes are plainly seen through the shell of the egg, but still a month at least before the time they will hatch. They are packed in specially-constructed crates in which they are kept at a low temperature to retard development. In this way they may be shipped to even more distant points than New Zealand. Upon arrival at their destination the eggs are kept in water at one of the fish hatcheries until they hatch out, and when the young fish are able to care for themselves they are liberated in the stream.

The following interesting account showing the success of the experiments is taken from the report of L. F. Ayson, Chief Inspector of Fisheries, New Zealand, for the year 1916–17:

"The number of [quinnat] salmon eggs collected last spawning season was 1,106,000; 866,000 were collected at the Hakataramea Station and 240,000 from the Dobson River. An effort was made to net the Ahuriri River for spawning salmon, but on account of the heavy current and freshets the attempt was not successful. The salmon eggs were disposed of as follows: 25,000 were supplied to the Tasmanian Government, 1,000,000 were sent to the West Coast to stock the Hokitika River, and 81,000 were hatched out at Hakataramea.

"I estimate that quite four times as many salmon came up the Waitaki last spawning season as during the season of 1915; the collection of eggs was more than four times the quantity taken the previous year.

"With regard to the time that these salmon commence to run in from the sea, the first fish this season was taken during the last week of January. A very large run came in during the last two weeks of February, and all through the month of March. In the Waitaki they were taken freely by trout-anglers; the number landed in this way is estimated at about 400 fish, averaging about 16 pounds in weight; and about the same number are reported as having been taken in the Rangitata, averaging about 17 pounds. The run of salmon in the Waitaki this spawning season is far ahead of last year's run. From the number of fish which are now running in the Hakataramea, and judging the other three large tributaries by the number of salmon which myself and assistants have seen in the Ohau River, it is no exaggeration to say that the salmon in the Waitaki and its tributaries this season must number tens of thousands.

"As it has been proved that salmon eggs can now be collected in large quantities, the department has decided on a vigorous policy with regard to stocking other suitable rivers throughout the Dominion. During the past summer a hatchery capable of dealing with half a million eggs was erected on a tributary of the Wairau River (Marlborough), and a site for a hatchery has been secured at Wanaka Lake, where temporary arrangements will be made this season for the purpose of hatching out half a million eggs for the purpose of stocking

the Molyneux River. It is intended this season to allot half a million eggs to each of the three rivers which the department has now in hand—viz: the Hokitika, Wairau, and Molyneux. The result of the inquiries made goes to show that the salmon have spread along the coast north as far as the Wairau (North Canterbury), and south to the Taieri River. The Taieri is at times rather badly polluted by gold mining, but from an examination of the tideway at its mouth, and its condition in the gorge above Outram, I think it is quite possible for salmon to make their way up to the clear tributaries beyond where the races from the sluicing claims join the main river.

"The very rapid increase of the quinnat salmon must be considered as most satisfactory, and the time is very near indeed when they will be placed on the market, and the people of the Dominion will have New Zealand-grown salmon on their tables. New Zealand has the distinction of being the only country in the Southern Hemisphere which has successfully acclimatized salmon, and on the authority of experts it is said to be the only country in the world which has been successful in acclimatizing this salmon away from its native habitat. The success attained in acclimatizing this fish is undoubtedly due to the systematic and vigorous effort made by the Marine Department, commencing in 1900. Had any of these prolific fish survived from the spasmodic efforts made to acclimatize them previous to 1900, they would have declared themselves long before the department commenced its importations in 1900."

BIGHORN SHEEP IN THE VICINITY OF CLAREMONT, CALIFORNIA.

By Leon L. Gardner.

(*Contribution from the Department of Zoology of Pomona College.*)

That mountain or bighorn sheep still exist in small bands in various parts of the California mountains is a fact well known. It, however, comes as a welcome surprise to find them living, breeding and at least holding their own in numbers, in the mountains not farther than thirty miles from Los Angeles. Vague reports from old hunters that in certain parts of the ranges near Mount San Antonio, commonly known as "Old Baldy," there were "wild goats and sheep," and that they were "mighty hard to get near to," furnished the incentive for investigations which have demonstrated that one species of bighorn sheep occurs in the ranges north of Claremont, Los Angeles County. Whether or not this is the Nelson bighorn (*Ovis nelsoni*) is an open question which can be decided only by the collection and study of specimens.

The rumor relating to the occurrence of wild goats is undoubtedly based upon the observation by hunters of the females and young sheep with their smaller horns. A case in point is the sheep's head found in Ice House Canyon in the spring of 1916. The severe rains of the year had washed it down from the mountainside and it was found at the canyon bottom and brought into Camp Baldy. Word went out that the head of a mountain goat had been found, and the writer immediately

hastened up to the camp to see it. It proved to be the head of a young bighorn, but on account of the short horns and hair, now bleached nearly white through weathering, the mistake had been very natural.

The mountains of the region are much like all the southern California mountains, with brush-covered, south-facing slopes, while the shaded north-facing areas are fairly well wooded. The outstanding feature of this particular region is Mount San Antonio, or better known as "Old Baldy," which stands 10,080 feet above sea level. From it radiate great mountain ridges to the north, east, west and southwest, much as spokes from the hub of a wheel. The whole system is thus connected up by continuous ridges. In this great extent of territory the sheep occupy a very definite area. This includes Ontario, Cucamonga and Telegraph peaks, with their intervening ridges, also Iron Mountain and

Fig. 19. United States Geological Survey topographic map, showing the distribution of big-horned sheep in the vicinity of Mount San Antonio (Old Baldy).

its connection with "Old Baldy," and the ridge between this latter peak and Telegraph (see fig. 19). In the writer's opinion, this is the area of their widest distribution, their favorite haunts being the region around Ontario, Cucamonga and Telegraph peaks.

To seek out and study the sheep in this array of jagged spurs and protecting hollows is a task difficult in itself, and is made none the easier by their timidity. Their wariness was impressed upon the writer by an encounter on June 12, 1915. The approach to Telegraph Peak was made by the ridge from "Old Baldy." While this peak was yet a considerable distance away, the writer's attention was attracted to a spot near the summit by a clear, thin rattling caused by a rock slide down the steep slope. It was apparent that some large animal was the cause of it, and close scrutiny disclosed three heavy-bodied animals bounding up the mountainside with great speed, and with no regard to

the great quantities of stones dislodged. As each sheep in turn reached the summit, curiosity gained the upper hand, and it turned, gazed down in a bland, questioning way, and then with a quick turn, head erect, trotted stiffly over the top and disappeared to view. On account of the hard soil, the tracks could not be followed and pursuit was impossible.

Just what the sheep were doing on that barren rock slide is hard to say. They could hardly have been in the act of quitting the peak, for that particular spot was some distance from any ridge, being on a slope that ended only in the canyon a considerable distance below. If it was food they were seeking, they were certainly going to a great deal of extra effort, for there was plenty at the summit. This was quite evidently a stray trio of more adventuresome or restless females or young males, for no big-horned ram was with them. They might very possibly have been members of a larger band on the other side of the mountain. This seems the more likely in view of the fact that about an hour later, in a location not so very distant from where the sheep were seen, the writer came across fresh tracks of a whole band of sheep.

Just how the sheep detected the presence of a human being is an interesting question. The air was quite still, so they could have received no warning through a telltale scent. It seems more likely they were given notice through the sense of sight. If so, their vision is very acute, for the writer was alone, dressed very inconspicuously and still at a considerable distance.

Another definite encounter occurred in September of 1914. This one was purely fortuitous. A fruitless hunt for deer had at last led to the outermost point on Ontario Peak, and here a rest was taken on the top of a big rock. About midafternoon the silence was broken by faint yet unmistakable sounds, which could have only been made by a whole troop of animals. There was the sound of twigs snapping, the bleating of lambs and the peculiar shuffling sound caused by the tramp of many feet. It was very evident that a band of sheep was approaching. A cautious observation over the edge of the rock disclosed a very interesting sight. Coming along the top of the ridge was a party of sheep, an individual stopping here and there to nibble at the vegetation. The rams, with their great curling horns, were a majestic sight, while the young of the year were exceedingly playful and altogether charming. Unfortunately at this stage a scent warned the sheep. In a second the whole band halted, heads up, noses questioning, then at an invisible signal they all wheeled and made off in jerky, stiff-legged, bouncing leaps, and quickly disappeared from view.

At various other times sheep were seen, but under very unsatisfactory conditions. Either the distance was so great that nothing could be learned, or but a very fleeting glimpse was caught of the band in flight. One is often given the aggravating impression that he comes too late or that the sheep were too sharp-eyed and had taken to safety.

However, although themselves difficult to locate, unmistakable traces of the sheep are to be found if carefully sought. Here one sees the grass cropped, the bushes nibbled, there the scattered droppings, and in spots where the soil is powdery enough, or by a moist stream bank, the clear large footprints in great abundance. One might almost study the distribution of the sheep through this means alone. Thus the writer

one day came across a well-beaten sheep trail on the ridge between Ontario and Telegraph peaks. In most places the soil is too hard and rocky to take a print, hence tracks are not as abundant as one might suppose.

Regarding the general habits of the sheep, several points seem clear. As before noted, they are very shy and alert, despite years of freedom from pursuit by man. From the fact that tracks when found are usually in great abundance, and from direct observation, it is evident that they travel most often in bands. However, the occasional sight of one, two or three odd sheep perhaps points to the conclusion that certain individuals at times stray from or are cast out of the band. This might occur in the case of several males striving for the leadership of the band. It seems very possible that adventuresome young, especially males, not yet arrived at the breeding age, might stray from the herd.

From the appearance of the lambs in late September, at which time they are quite active, the writer would put the lambing season in late February and early March.

The question of water is not a serious one for the sheep. Not only is water accessible in the headwaters of the canyon streams, but springs issuing from the sides of Ontario Peak, at some places within 200 feet of the top, give a ready supply. This whole region in winter is covered with a heavy blanket of snow, and this, when melting in the summer, often forms large pools of clear water. That the sheep move about and drink at night is evidenced by one observation, when several of them were seen one moonlight night to slip down to one of the springs on Ontario and drink.

What constitutes their food can not readily be told without long-continued observations during feeding (a very difficult and well-nigh impossible task) and by a study of the stomach contents. There is no doubt, however, that the following plants form an important part of the diet: the leaves of the chinquapin (*Castanopsis sempervirens*), a wild parsnip (*Palpinacea sativa*) growing around water holes, berries of the manzanita (*Arctostaphylos*), twigs and leaves of *Rhus trilobata* and *Rhamnus crocens californicus,* and finally grass growing near springs and streamlets.

All that has been said applies to the sheep only during the warm season of the year. What becomes of them in winter is not known. They are certainly not at the mountain tops. The heavy snow blanket covering the mountains thaws during warmer spells only to freeze again into a solid sheet of ice. At such times they become exceedingly slippery and dangerous, and it seems inconceivable that the sheep or any living creature of large size could avoid sliding off into the canyons below.

There are two places that give great promise as wintering areas. These are the spurs to the northeast of Cucamonga and Telegraph peaks, respectively. They drop low enough to receive only an occasional, transient snow covering. This region is exceedingly wild, trailless, and not visited by man, and would seem to present all the requirements of winter quarters for the sheep.

Regarding the number of sheep living in this territory, it is not possible to say definitely. If all the sheep are in one band, then their number is between fifty and sixty head. There is, however, no evidence

to show that there are not dozens of sheep scattered all over the range, or that there are not two or more bands of varying sizes. The writer is inclined to feel that there is but one band, with only a few outlying stragglers. Much can be done toward answering these points if the sheep could be found in the winter, when their range is greatly restricted.

A study of this kind presents many other questions of great interest. It would, for instance, be very interesting to obtain, if possible, a history of these sheep. How long have they been known in this section, and are they remnants of a one-time larger band that was more widely distributed? It also seems very possible that there are other bands of sheep in favorable localities, such, for instance, as North Baldy and the series of nonfrequented peaks in connection with it. Even the species is unknown, and from this as a starting point the problems extend endlessly.

With a wise and rigorously protective state law and a range that will not for years to come be encroached upon by man, there is everything in favor of a bright future for the mountain sheep of eastern Los Angeles County.

DEER LICKS OF THE TRINITY NATIONAL FOREST GAME REFUGE.

By Harold C. Bryant.

Heretofore, we have had to base our judgment as to the value of a game refuge largely upon the results obtained in The Transvaal in South Africa, and in other states. Convincing evidence of results to be expected from game refuges in California is now available, in that the first of the large state game refuges placed in a national forest has been in existence long enough to demonstrate possibilities.

Trinity Game Refuge was established by legislative enactment in 1911. Comprising 65,000 acres of brush and timberland, with abundant water and feed, and salt licks convenient, the region affords ideal conditions. A visit to this refuge at the present time will attest the worthwhileness of a sanctuary for deer and other game.

Although in a county where violations of the fish and game laws are frequent, the residents respect the game refuge. The people of the county wanted the refuge in the first place, and although it set aside much of the best deer country, everyone concerned is willing to be inconvenienced and to hunt elsewhere. Originally reporting the largest deer kill of any county, a noticeable decrease for several years brought a realization that something needed to be done to save the situation. The result was a demand for a game refuge. The interest taken by the United States Forest Service has had much to do with the attitude of the residents and the enforcement of the game laws.

Within the refuge are many famous deer licks, where in former years deer were killed by the thousands. Residents estimate that there were 10,000 deer killed at the licks near the north fork of Trinity River, up to the time of the creation of the refuge.

Fig. 20. View of portion of Trinity Game Refuge on the Hayfork River. Photograph by H. C. Bryant.

The writer visited the Trinity refuge during the latter part of May, 1917. Trips were made to the licks along the Trinity River near Helena, and also to the numerous licks along the Hayfork River, about ten miles from the town of Hayfork. At both of these places there was plenty of evidence that deer were very numerous and very tame.

Fig. 21. A typical deer lick comprising a mineral spring on the Trinity River near Helena, Trinity County. Photograph by H. C. Bryant.

On May 23, Deputy G. O. Laws and I went early to the large lick about two miles down Trinity River from the town of Helena. We seated ourselves about thirty-five yards away, but in plain sight of the approach and the hillside in the background. After waiting for some time we were rewarded, not only by seeing ten deer within good range along the hillside, but also had the pleasure of having two does come to the lick and spend several minutes there. We attempted to photograph them, but the early morning light was not sufficient to make the pictures successful. It was only after we had stood up to take the third photograph that the deer became sufficiently frightened to leave the lick. Even then they did not run, but simply walked back up the hill. The sand next to the river showed that large numbers of deer

Fig. 22. Doe at deer lick on Hayfork River in Trinity Game Refuge. Photograph by H. C. Bryant.

had been at the lick during the night. All of the deer seen at close range were does; tracks also indicated a large percentage of does. When about to leave, four deer came over the hill and started toward the lick, but they "winded" us before they had gone half way down the hill, and turned back.

A trip, in company with Mr. Shock, to the numerous licks along Hayfork River, about ten miles from the town of Hayfork, gave even better results. One large lick inspected (Sulphur Spring) had been used during the night, and it was evident that a number of deer had been frightened away upon "winding" us. Even so early in the year trails were cut three and four inches deep. The tracks here indicated a large percentage of bucks.

Farther down the river, we seated ourselves on the bank of the river opposite what local residents have often termed the "Big Lick." We had been there less than five minutes when two deer appeared and spent

some time at the lick. A screen of tree branches prevented photographs being taken. After these deer had left we moved our location, taking up a station directly across from the lick. We were in plain sight and but thirty-two yards away. During a wait of a little over two hours we were rewarded by seeing a dozen deer come to the lick. Several of the animals saw us, and at each click of the camera the head was raised and the ears pointed forward, and yet there was no sign of fright. The climax came when at 10.15 in the morning two bucks and two does came to the lick, and spent five or ten minutes there. (See fig. 24.)

Fig. 23. Deer startled by the click of the camera at "Big Lick" on the Hayfork River in Trinity Game Refuge. Photograph by H. C. Bryant.

The antlers of the bucks at this time of the year were from four to six inches in length, the knob at the end just beginning to indicate a branching. Bucks were most in evidence at this lick, only three or four does being seen.

Probably nowhere in the state is it possible to find so many deer, or find them so tame, as in this Trinity refuge. Evidently the refuge forms a great game farm where the animals increase in numbers and then spread out to surrounding localities, furnishing food and sport for all those who wish.

Natural conditions are of the best. Artificial means may, however, improve the annual crop. Deer in this breeding area, although safe from attack by man, are still subject to attack by many predatory animals. Some work is being done by the United States Department

of Agriculture to reduce the number of coyotes and mountain lions, but still more work along this line needs to be done. Refuges of this kind, even though they have proved their worth, should be more than refuges on paper. They need to be well guarded and at the same time made more effective by the destruction of predatory animals. Attention needs to be paid also to every means of making the deer more prolific.

Fig. 24. Four deer at "Big Lick" on Hayfork River, Trinity Game Refuge. Photograph by H. C. Bryant.

It may be that salt bricks placed in certain parts of the refuge would aid in keeping the animals in good health. This area, at several different times, has been ravaged by a disease which killed off great numbers of deer. Investigations as to the cause and the cure of this disease would also be of value in increasing the effectiveness of the area. During certain years winter feeding might prove worth while.

The creation of the Trinity Game Refuge has assured a permanent supply of big game to Trinity County and is demonstrating to the whole state the benefits which accrue as a direct result of proper game protection.

UNAPPRECIATED FRIENDS.*

By John G. Tyler.

It is a well established fact that any disturbance of natural conditions in a given area, whether brought about by drainage, irrigation, deforestation or a change in crops or natural products, has a marked, and sometimes immediate effect, upon the Flora and Fauna of that region, and this has been demonstrated in a very striking manner in the San Joaquin Valley, where we are accustomed to do large things and to do them quickly. In this valley, when we speak of an irrigation project, it is usually not in terms of acres or hundreds of acres, but of thousands of acres. The effect of draining large areas of marsh land and converting such tracts into grain fields has been to metamorphose completely the wild life of such places, while the constant transformation of previously uncultivated tracts into fruit orchards and alfalfa fields has brought about equally startling changes.

In days not long passed stock raising was the principal occupation in many parts of the San Joaquin Valley and among our older residents there are still not a few who can recall the time when magpies were as common as sparrows and the sight of glistening flocks of snowy egrets was an everyday occurrence. Then, too, the great California vulture, or condor, swept over the valley searching for carrion on which to feed before returning to its favorite cliffs in the Coast Range Mountains. Dr. Heermann, a naturalist with one of the parties of the Pacific railroad surveys, recorded in 1859, that they found the bald eagle in the Tulare Valley, on the borders of large lakes, and in one place counted three nests within sight of each other. The accounts of these explorers are most interesting reading, but we can not escape a feeling of sadness as we realize that these and many other birds have all but disappeared forever from nearly every section of our country.

The stock men did not hesitate to destroy eagles at every opportunity because occasionally a lamb was carried away or a weakling calf was killed, albeit the eagle much preferred a diet of fish or the ducks and coots which he could pick up along the streams and ponds. The destruction of magpies and condors, however, was brought about by wilful carelessness and indifference, for the condors, especially, lived almost entirely upon carrion and could not be charged with destroying either stock or wild game. It was poison indiscriminately placed in the carcasses of cattle and sheep to kill coyotes, lions and other animals that decimated the ranks of these splendid birds, and had not stock raising given away to grain farming, California would soon have lost its right to claim the largest North American bird.

With the advent of vast fields of grain a new set of problems began to confront the settler and the large carnivorous animals were no longer a menace. However, new enemies soon appeared in the shape of ground squirrels, gophers, mice and rabbits which annually destroyed untold bushels of grain. But, here again a lack of foresight was manifested, for instead of exterminating these rodents, we began a concerted persecution of the very creatures that fed upon them. Golden eagles and the large slow-flying hawks sought the squirrels by day, and at night several

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species of owls preyed upon the smaller mammals; yet every man's hand was against these useful birds and when an occasional fowl disappeared as a result of a visit from some swift-winged falcon, the event was heralded far and wide as absolutely indisputable evidence that all large birds are blood-thirsty destroyers of poultry, and even when a very small amount of investigation would have shown that a weasel or fox was responsible for the loss, it was much easier to place the blame on a "hen hawk" and wage unceasing persecutions on all members of the hawk family, both large and small.

In 1878 Lyman Belding, one of the pioneers in San Joaquin Valley ornithology, secured several specimens of the white-tailed kite, which were sent to the United States National Museum for examination and study. In describing these Mr. Belding wrote as follows: "This is a common constant resident of Stockton, where I have seen as many as twenty at the same moment within a circle of half a mile. The specimens I sent were stained * * * from catching mice in a large alfalfa field in the reclaimed tule ground."

In 1915, Dr. Joseph Grinnell of the University of California, after exhausting every means for obtaining information regarding this species, was forced to say: "It is now everywhere very much reduced in numbers and restricted in range, with promise of early extinction." What a pity it could not have been spared to continue its useful work.

But even now when the grain fields have been replaced, to a large extent, by vineyards; when alfalfa fields spread a green carpet over acre after acre, and when the blossoming fruit trees impart a fragrance and beauty to the entire valley, the conservationist has difficulties to face; for with far too many of our farmers it is the rule to regard with suspicion any small bird seen about the farm, and even the wholly insectivorous species are given scanty welcome. Any bird seen on the ground in the gardens or fields is put down as having been caught in the act of digging out seeds or pulling up sprouting grain, and if it ventures near the orchard it is immediately charged with picking off buds or eating fruit.

It is inevitable that in the evolution of a vast empire like the San Joaquin Valley from virgin soil to the most productive area of equal size in the world, we must lose certain species which, from the esthetic standpoint it is highly desirable to preserve; but we can not expect the practical, up-to-date agriculturist to give heed to any argument which embraces nothing more than mere sentiment. Fortunately, however, many farmers have come to realize that from a cold dollars and cents point of view they can not longer afford to be uninformed regarding the economic value of each and every wild creature in their neighborhood. It is too late now to waste time in idle regrets over past mistakes and neglected opportunities, but no well-informed student of these problems would gainsay the fact that our farmers might have been saved many thousands of dollars during the past few years if all concerned had been better informed along these lines.

A short time ago we read of a commissioner being sent to a foreign country, at an expense of several thousand dollars, to discover, if possible, an enemy that would prey upon a certain insect pest. This necessity might possibly never have arisen had our native birds been allowed to carry on the work which nature intended for them.

Even now we are in the midst of a far-reaching and expensive campaign against the destructive ground squirrels, which have increased just in proportion to the decrease of their natural enemies, the raptorial birds. Our horticultural commissioners, too, are searching far and wide for new insecticides and sprays for the control of insect pests, and when we recall in connection with this latter statement the fact that the stomach of a single Brewer blackbird, taken for examination, was found to contain 374 larvæ, 65 pupæ, and three adult alfalfa weevils, besides several other bugs, we can not but reflect that possibly our efforts were too much in one direction.

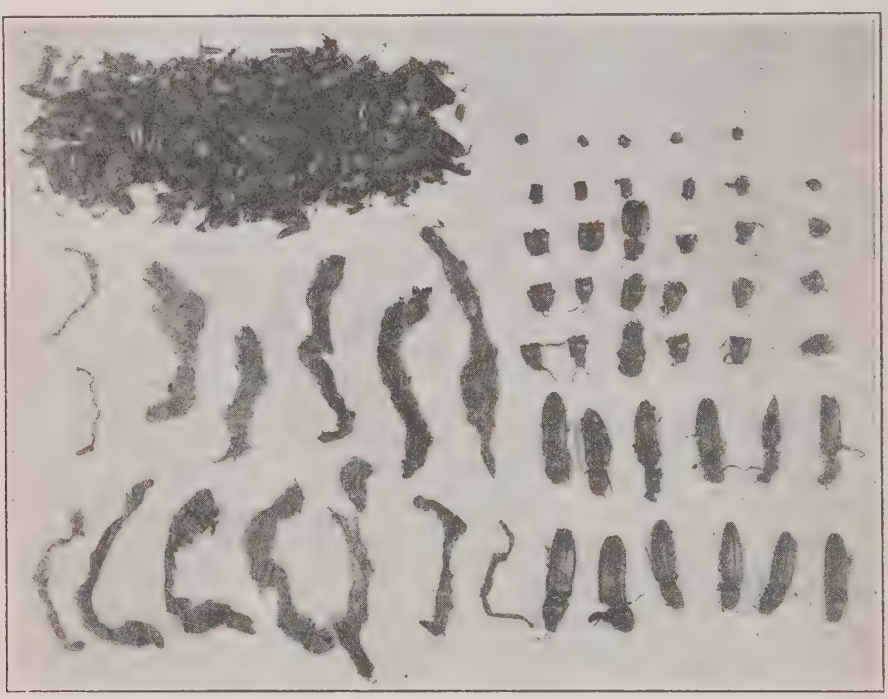

Fig. 25. Photograph showing stomach contents of a western meadowlark. This stomach contained thirteen cutworms, twenty-six elaterid beetles, the larva of which is the wire worm, and ten small ground beetles. Photograph by H. C. Bryant.

Lest some might misunderstand the author's purpose in presenting this article, let it be understood that this is not a plea for mere indiscriminate protection to any and all wild birds, for such a course would be, in a measure, almost as ill-advised as the one we have been pursuing.

There is urgent need in the San Joaquin Valley for a thorough and systematic study of our birds in relation to the farmer and his crops. This is one phase of our instruction in scientific farming that has apparently fallen just between the work of the farm adviser and the duties of the horticultural commissioner, with the result that we are still woefully in the dark when we seek information along this line. Several of the eastern states have recognized this need and are meeting it by appointing a competent official whose duty it is to carry on field

and laboratory investigations, giving advice to farmers, and to issue bulletins from time to time giving the results of his studies. In carrying on such work it is sometimes necessary to destroy a limited number of birds in order to make a correct analysis of the food that has been eaten, but this loss is more than compensated for if the skins of such be preserved as scientific specimens, as they serve a useful purpose in assisting farmers to identify the various species with which they come in contact, and are always of great value for school work. The cost of equipping a small museum and laboratories and of carrying on the necessary work is but the merest trifle when compared with the far-reaching and lasting benefits to be derived.

Because of geographical and climatic conditions the San Joaquin Valley offers peculiar problems. We can not take advantage, to any extent, of the knowledge gained in other states as our avian population differs even from that of other parts of California. Several species have gone forever; others are becoming more scarce each year, but we can not hope to create a widespread public sentiment in favor of their protection until we can show conclusively that it is to everybody's advantage to encourage their presence.

Shall we continue to neglect this important work until some insect outbreak forces us to action, or shall we acknowledge our obligation to ourselves and the future settlers of the San Joaquin Valley?

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

January 28, 1918.

"More fish and better fishing; more game and better hunting; more sport and better sportsmanship."—GOV. JAS. WITHYCOMBE, of Oregon.

FISH AND GAME ENDANGERED.

These are the times when wild life is greatly endangered. Market hunters in New York and in other states are attempting to again establish the sale of game. Selfish hunters are advocating the free killing of fish and game in order to furnish increased food supply during the period of the war. Even officials, forgetting the need of conservation for the future, are being persuaded to let the bars down. A telegram recently referred to the California Fish and Game Commission and signed by a government official advocated the setting aside of protective laws for sea fish during the period of the war. This request is particularly interesting in view of the fact that with no protection, salmon, striped bass, shad and many other anadromous fish could easily be exterminated within a few years, and furthermore that the larger markets have been so glutted with marine fishes that tons have been sent to the fertilizer works and fish meal factories. We may expect still greater pressure by selfish interests and by those who forget in the emergency that now of all times there should be a strengthening of protection, rather than a lessening. Unless every conservationist stands squarely for sufficient protection to perpetuate game species, the enemies of wild life will make short work of our wild life resources by taking advantage of the present situation.

RICE DAMAGE BY DUCKS.

There has been much newspaper publicity given to the depredations of ducks in the rice fields of the Sacramento Valley. It appears that some of this publicity has been the work of selfish hunters desiring to hunt ducks before the season opens. Proof of this is apparent in the fact that most rice growers will not allow duck hunters in their fields. On the other hand, it appears that some growers have received severe loss from ducks. Certain it is, also, that many of the ducks shot this season had their crops filled with rice. The Fish and Game Commission realizes that the problem of protecting the rice fields in the Sacramento Valley is a serious one and it is anxious to reach a solution fair to both the grower and the hunter. Especially is it desirable to rightly settle the controversy, owing to the food situation. Consequently, the Commission plans to hold in the near future a conference with rice growers to obtain their point of view. Furthermore, during the fall of 1918, a special investigation will be made in those districts where depredations are reported.

NEW PATROL BOAT FOR SOUTHERN CALIFORNIA.

During the last part of December the new patrol boat, which is to be named the "Albacore," will be launched from the Fulton Shipyard at Wilmington. This boat is to be used for patrol work and scientific investigation along the coast of southern California. Although designed on lines similar to those of the tuna boats, it is nevertheless suitable for special work, ample deck room being made for handling nets and other apparatus used in investigations (see Fig. 28). The boat is built of wood, has a length of sixty feet, a beam of twelve feet and a draft of five feet. The interior arrangement provides for a large stateroom giving comfortable quarters for four, and a laboratory.

A 65 h. p., four-cylinder, Acme gas engine will furnish the motive power.

This engine will be installed during the month of January. Mr. H. B. Nidever has superintended the work of construction and has seen to it that the boat meets the requirements in every respect.

BOUNTIES.

Some interesting bounty figures from the State of Wisconsin convincingly prove the ineffective and wasteful system instituted in many states to reduce predatory animals. Did Wisconsin get its money's worth between 1906 and 1916 by paying the following amounts in bounties on wolves, lynx and wildcats? Nor do these figures give evidence of the fraud which invariably accompanies the bounty system.

1906	$61,522
1907	51,068
1908	49,248
1909	47,706
1910	40,428
1911	35,934
1912	35,506
1913	38,126
1914	42,928
1915	42,764
1916	39,198
Total	$480,428

We very much doubt whether the saving was anywhere near commensurable with the amount paid, and yet not a session of the legislature goes by but a bounty system is proposed for our own state.

ATTENTION, TRAPPERS!

In order to give proper protection to fur-bearing mammals before it is too late, a trappers' license law was passed by the last legislature. It is now necessary for all trappers over eighteen years of age "who trap for profit" to obtain a trapper's license (citizen, $1.00; alien, $2.00). Those under eighteen years are required to obtain a license, although no fee is charged. Each licensed trapper is required to report his catch before July 1 of each year.

The more notable provisions of the law are as follows:

Open season for black or brown bear, ring-tail cat, coon, pine marten, fisher, wolverine, mink, skunk, river otter, and fox November 1 to March 1.

No open season for beaver or sea otter.

It is unlawful to use poisons in taking

Fig. 26. Joint exhibit of the United States Forest Service and the California Fish and Game Commission at the State Fair, 1917. Courtesy U. S. Forest Service.

fur animals or to dig or smoke out skunks from dens.

Fur-bearing animals may be killed at any time when destroying property.

Seals and sea lions are protected at all times in Game District Nineteen.

There are no legal restrictions to the propagation of fur-bearing mammals in the state.

FORESTRY AND FISH AND GAME EXHIBIT AT STATE FAIR.

The odor of mountain forests and the sound of running water greeted the visitor to the joint exhibit of the California Fish and Game Commission and the United States Forest Service at the State Fair, held in Sacramento, September 8–16, 1917. Avoiding artificiality as far as possible, the exhibit took the form of a miniature forest, in which was to be found a Forest Service lookout tower, aquaria containing several varieties of fine large trout, a model hunter's camp, with bags of different varieties of game hanging nearby, and a pond with thirteen different species of waterfowl upon it.

Pine, fir and cedar trees were brought from the Tahoe National Forest, near Grass Valley, and a space fifty feet square was turned into a forest. On entering between rows of pines and firs, the visitor was invited to inspect the lookout tower, where an attendant explained the manner in which forest officers discover and locate forest fires. There was also on exhibition a heliograph, an instrument utilizing the sun's rays to flash messages.

Beneath this lookout tower an ingenious method of showing the five principal causes of forest fires was to be found. The rotation of a wheel-like structure brought in view a series of small models showing automobilists dropping cigarettes and matches, homesteaders burning brush, campers leaving a camp fire still burning, lightning striking a tree and a railway train, from which sparks might start a fire. A touch of realism was added to the lightning scene by the use of an induction coil and a piece of tin, with which a semblance of lightning and thunder was obtained, and to the forest fire by the use of volumes of smoke.

Fig. 27. Part of educational exhibit of California Fish and Game Commission at State Fair, 1917. The mountain lion is represented as killing a fawn, and details as to the destructiveness of this animal are given on the accompanying placard. To the right is shown canned fishery products and data on California fisheries. Photograph by H. C. Bryant.

The fish exhibit consisted of a model fish ladder and a fish screen in operation, a small cement pond containing many of the food fishes which have been introduced into the Sacramento and San Joaquin rivers—crappie, bluegill sunfish, black bass and carp, and two large glass aquaria containing rainbow, Loch Leven and eastern brook trout. Hatching troughs contained trout and salmon fry.

Inside the tent, which represented a hunter's camp, was an educational exhibit. Attracting most attention were several mounted groups; a mountain lion killing a deer, a Cooper hawk killing a quail, and a barn owl with a gopher. These groups appeared to impress every visitor and even had they not been

labeled, the meaning of each would have been self-evident. Some fine photographs of birds, furnished by W. L. Dawson, of Santa Barbara, an exhibit of different varieties of tuna and sardines canned in California, and an exhibit showing the food habits of some of the non-game birds, together with charts and maps, completed this part of the exhibit.

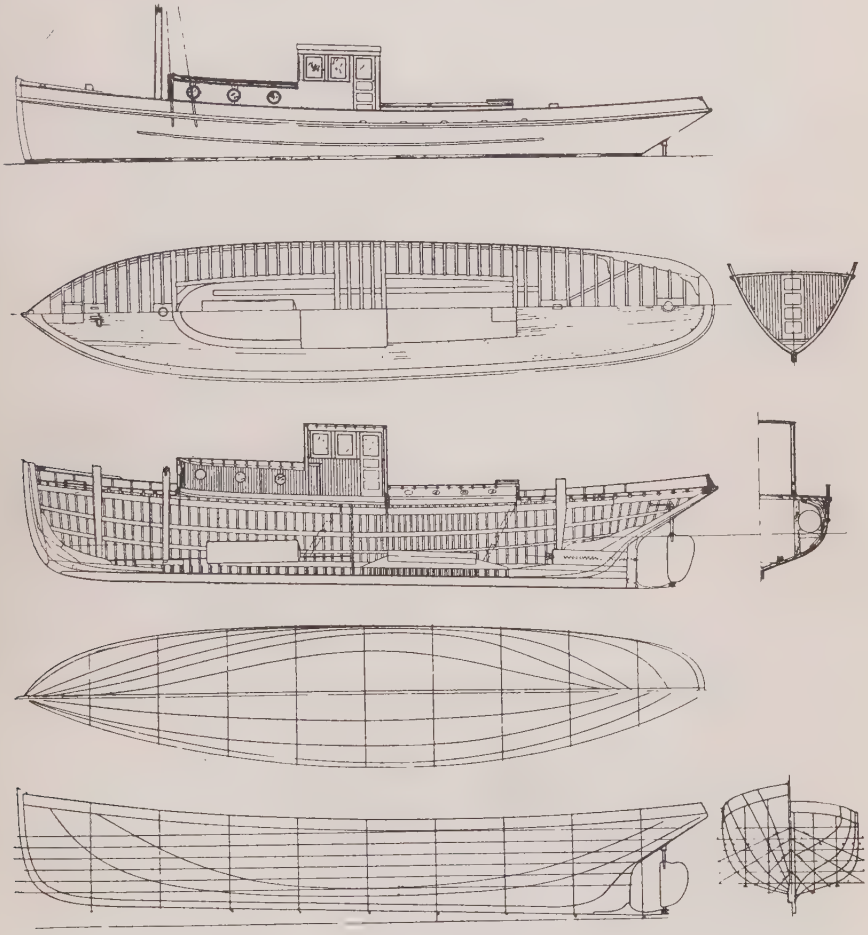

Fig. 28. Working drawings of new commercial fisheries patrol boat. This boat will be used in connection with fishery investigations and patrol work in southern California.

A pen containing a pond, on which were to be seen thirteen different varieties of wild ducks and geese, gave those interested a fine chance to test their ability to recognize the different species in the wild. Of more than usual interest were a pair of wood ducks and a pair of fulvous tree-ducks, the latter birds more like geese than ducks, and often known as "Mexican ducks." Although nesting in the San Joaquin Valley, they are seldom seen during the open season on water-fowl, and consequently are little known by sportsmen.

That visitors were really interested in the work of the two organizations concerned with the conservation of forests and wild life was evidenced in the great demand for literature, and by the many questions asked of the attendants. The exhibit demonstrated methods of conserv-

ing natural resources and showed what the Forest Service and the Fish and Game Commission are doing to perpetuate California forests and California fish and game. The educational value of such an exhibit can not be overrated.

THE COST OF RAISING PHEASANTS AND DUCKS.

In that such game birds as pheasants and wild ducks are fast coming to find a place in the market, and in that there is increased interest in game farming, attempts are being made to estimate the cost of rearing such birds. Samuel Evans, the largest commercial game breeder in the United States, figures the total cost of rearing a pheasant as somewhere between one dollar and a half and two dollars. Mr. Dunn, of the Clove Valley Rod and Gun Club, maintains that one dollar and a half is close to the correct figure for the rearing and maintenance of a pheasant for a full period of twelve months. Mallard ducks can be reared for a slightly less cost.

THE ENABLING ACT OF THE FEDERAL MIGRATORY BIRD LAW.

The Federal Migratory Bird Law became effective March 4, 1913. Because it was claimed that this law was unconstitutional, it has been difficult of enforcement. While the case was still pending before the Supreme Court, the United States and Canada ratified a treaty protecting migratory birds, which in effect made the Federal Migratory Bird Law apply over the greater part of North America. It is still necessary that an enabling act be passed to reinforce this law. Such an act was introduced in the House of Representatives, but failed to come to a vote before the term of Congress expired. The bill was reintroduced in the next session and was passed by the Senate on July 30, 1917, by a large majority. Action by the House was prevented owing to the pressure of war legislation, but doubtless the bill will be passed before the session closes. The Canadian Government has already passed its enabling act.

SAVING DEER FOR FOOD.

The United States Department of Agriculture, along with other recommendations, suggests the following ways of more largely utilizing the deer kill. Fortunately, some of the suggestions are enforced by law in this state:

"Do not kill a spike buck or doe when you can obtain a full-grown buck.

"Do not kill deer when weather conditions or difficulties of transportation prevent saving the meat.

"Save every pound of meat.

"Save the skin and the head also if the antlers are in good condition.

"Do not shoot deer at night, or in the water, or unless you can clearly see that the animal aimed at is a full-grown buck. Failure to observe this rule usually results in a violation of the game laws and often in the loss of human life."

Fig. 29. The results of a hunt at the opening of the season in Mendocino County. Each of the nine men in the party secured a buck.

NOVEL FISH AND GAME LEGISLATION.

A recent publication of the United States Department of Agriculture (Farmers Bull. 910) in giving a summary of the game laws for 1917 calls attention to the following novel game legislation:

The first game law placed on the statute books of any state through the medium of an initiative petition was adopted in Arizona at the general election in November, 1916.

Hunting game with flying machines has been made illegal in North Carolina by a law prohibiting shooting waterfowl on any of the waters of the state from an airplane.

Pennsylvania has imposed, as a penalty for conviction for a second offense under the game law, imprisonment equal to one day for each dollar of the fine and denial of license to hunt for two years.

Utah has passed a law prohibiting aliens from hunting in the state.

Wisconsin has extended its provision relative to seizure of paraphernalia used in violation of game law to include automobiles, which, when used by persons hunting illegally, may be confiscated by conservation officers.

The law in New Hampshire authorizing the payment of damages for injuries to live stock caused by persons hunting deer has been modified so that in future such damages will be assessed by the commissioner of agriculture and paid from the fish and game fund.

In South Carolina a specific tax on game preserves was imposed on all holdings in excess of 5,000 acres, except in Berkeley County, the rate of taxation being 2 cents an acre for tracts of 5,000 to 30,000 acres, 4 cents from 30,000 to 55,000 acres, and 5 cents for larger tracts.

Wyoming has provided for the establishment of zoological gardens in cities and towns and authorized the game commission to supply birds and animals for the collections.

Hunting on Sundays is prohibited in all states and provinces east of the one hundred and fifth meridian except Illinois, Louisiana, Michigan, Texas, Wisconsin, and Quebec.

Section 8 of the Canadian Migratory Birds Convention Act reads: "All guns, ammunition, boats, skiffs, canoes, punts and vessels of every description, teams, wagons and other outfits, decoys and appliances of every kind, used in violation of or for the purpose of violating this act or any regulation, and any bird, nest or egg taken, caught, killed or had in possession, in violation of this act or any regulation, may be seized and confiscated upon view by any game officer appointed under this act, or taken and removed by any person for delivery to any game officer or justice of the peace."

RECREATION.

I know there is not a man living who is tossed about month after month in the bustle and bang of business life who does not need a vacation; he needs it for his mental, moral and physical development; he needs the woods, the music of our streams, the warbling of the birds, and a chance to drive out the fetid air of a stuffy office and dusty street and to fill his lungs with pure, vigorous ozone found in the woods and open fields.

It is a misfortune to a man who does not enjoy Nature's greatest tonic, which she presents so freely in outdoor life. Sometimes there comes a longing to all of us for a camp fire in some shaded spot close to some good spring of pure water, with a frying pan over the coals, from which comes the scent of bacon. All of this can be found only in a life in the broad and health-giving open.

The greatest charm of nature is its wild life. The beauty of the hills and the mountains would be cold and desolate without the birds and animals that have delighted man since the beginning of time; music of the rivers and streams would be sad were it not for the sport of "going a-fishing."

Society is unconscious of the contentment to be found under the open sky and in the silent places. Natural things are wholesome, and a finer view of life and deeper sympathy with and for all living things is found along the primitive paths. Men and women all over the world are yearning for the simplicity of other days; are groping to find greater moral and physical strength and true happiness, which is apparently lost.—*Biennial Report, 1914–1916, Kansas State Fish and Game Warden.*

MUDHENS GOOD FOOD.

Believing that "conservation" means making use of every valuable food-product, the California Fish and Game Commission has launched an extensive publicity campaign in behalf of the common coot or "Mudhen," which already has established itself as a valuable bird in the South and parts of the East, but in the presence of so great a supply of more choice wildfowl, thus far has failed to find general recognition in the Golden State.

This is a time when everything edible should be given careful consideration; for months the Fish and Game Commission urged upon the people the greater use of fish, and in the present phenomenal increase of demand is seen a considerable ripening of the fruit in whose cultivation the commission was a pioneer on the Pacific coast.

The using of all perishables, and becoming better acquainted with every novel food product has become a patriotic duty wherein all may render aid of daily value. Realizing that only through wide publicity could the people be made familiar with the many good foods that annually go to waste, the State Board has been stimulating all possible the use of birds that most hunters throw away —a thing for which there can be no excuse, as if not worth using, why kill, or waste costly ammunition that could serve better purpose?

The worst thing about the "Mudhen" is its name, and the prejudice that this has built up against it. "Give a dog a bad name" has proved its truth. As a matter of fact, there is nothing new in the use of mudhens on this coast. Leading hotels have served them as "water chicken" in San Diego for years; and as "tule hen" they appeared on Fred Harvey's celebrated bills of fare regularly. Known South as "Poule d' Eau" and served a la Creole, they attained a more than local fame down New Orleans way, great center of bon vivants that it is.

Mudhens are perhaps better relished by their French name which is more truly descriptive of their habits, as they are a water bird rather than a mud frequenter. Their diet is identical with that of ducks, and in dry seasons when there is not much grass the flesh stays hard. In general they are to be handled like rabbits in preparation for the table. Stews are the general method of cooking; but those willing to pluck fat ones can roast them and have a bird little inferior to duck except milder in flavor, hence relished by some to whom the gamy flavor of a duck is not acceptable. They are easy to skin, but the process removes the rich and valuable fat, so is to be condemned, as all such fat should be made useful. To add other fats, such as bacon, is needless extravagance.

Soaking the birds several days in cheap claret imparts a most delicious flavor, and is a method followed by some of the most celebrated cooks, one of whom has been serving "mudhens" in his cafe for nearly twenty years in Los Angeles as "Salmi of Duck," delighting thousands who never suspected that they were eating the same mudhen that had been left to lie before their guns as supposedly worthless.

Nowadays, as a result of publicity, one sees strings of the blackish birds, nor are sportsmen ashamed to admit their shooting them either; for the making use of anything hitherto wasted is realized to be a most practical form of patriotism, and to be a proper source of personal pride.

The common ruddy duck or "wiretail" is a delicious bird on the mountain lakes when fed on the rich, sweet aquatic food-plants so relished by the big ducks, and sportsmen are also making wide use of these fat little fowl this season.—EDWIN L. HEDDERLY.

WILDFOWLERS LUCKY.

Favored by the wonderful balmy weather of a typical southern California winter, sportsmen have played in phenomenal luck throughout the present season until a week before Christmas finds the mountain lakes still open; the highways and by-ways still easily passable everywhere; a goodly supply of waste grain, weed-seeds and much natural food for wild game still unspoiled by rains. With the greatest duck and goose flight of any recent year reported from the interior valleys along the great rivers, and a good supply of birds on the mountain lakes which remain open to the

licensed hunter legally as well as climatically, the vast army of wildfowlers who are unattached to any clubs find themselves favored indeed by the continued delay of storms, which, although making better shooting, render the grounds difficult of access to the motorist who is willing to travel 150 or more miles for his week-end outings. The growth of the "good-roads" movement in California has greatly increased this class; until today, considering the comparative ease of access to the vast open shooting-grounds of the interior, the charge no longer rings true that one "must belong to an expensive gun-club to enjoy duck-shooting in southern California." There never was a time that men could not find better shooting away from the clubs, but it was not so accessible as now; and this year the clubmen have had a bad deal indeed from Nature. The scarcity of food in the extreme south where none of the clubs appears to have attacked the problem from a duck's point of view, has been accentuated by the increase of beet and bean farming which largely has replaced the barley-growing which used to provide sprig and wigeon with their principal staff-of-life hereabouts; and the clubmen have failed to provide any practical pond-growing substitute to take its place. Over-shooting and under-feeding are an impossible combination especially when coupled with mild weather, which offers no reason for ducks leaving the favorable feeding conditions of the great interior valleys, which have become more attractive since rice-growing was proved practicable, and now constitute such a paradise for wildfowl as probably can not be equalled anywhere else in the world.

California long since became famous among wildfowlers who watch their favorite sport in a broad, nation-wide way. From the days of '49, the vast inland waterways of this state have ranked as immense producers of wild game for food and sport. Today, despite a winter of typically Californian mildness, the entire interior of the state is swarming with ducks and geese of every coastal variety. The demonstration of formerly waste overflows as the best of rice land has added an enormous pulling power to the already proved attractions of the Sacramento and San Joaquin, Owens and Imperial valleys. Sportsmen well may be proud of their state, and glad to cheerfully contribute their license-dollars toward keeping up its gunning attractions, which draw the interest of their fellows of like mind with a magnetic power only to be appreciated by those in whom the love of wild life and healthful sport in the great outdoors still surges with primitive enthusiasm.

In the day of our National need, when this vast plenty of choicest wild meat lies open to the people free to whomsoever has the energy, experience and ability to "reduce to possession" these assets which belong equally to all until the superior prowess of some has rendered them personal possessions, the state's game has developed a peculiar and direct value, as a thing to be used wisely like an investment, its taking limited to the annual increase, lest a day of direr than present need develop when a greater than present supply must do its first duty by the people in the replacing of shipable meats. To this end exist all our restrictive laws; and those whom the limit seem to hit hard must not forget the reasons underlying it; nor the liberal privileges they enjoy when compared with the all but gameless states of the east, where drastic closed-seasons and small mess limits have utterly failed to stay extermination in the face of advancing agriculture and closer, more intensive farming methods. The game is given us to use wisely; not to set up on a pedestal of affectation as a monument to posterity; but for the best and widest present use compatible with maintaining the supply on a business basis for the future, exactly as any business man aims to handle his working capital.—Edwin L. Hedderly.

HOW TO DYNAMITE A STREAM.

Newspapers have been one of the most powerful forces in crystalizing sentiment in some of the states for the protection by proper laws of fish and game as important resources of the commonwealth.

A New Jersey editor, a thorough sportsman, recently received from a

reader who desired to take fish by questionable means a query saying:

"Please advise me how to dynamite a stream."

The newspaper man sent the following advice:

"Four sticks of dynamite are sufficient. Tie them securely around your neck, attach fuse, light it and run as fast as you can away from the water to avoid injuring the other snakes and reptiles."
—*Wild Life*, September, 1917.

MT. WHITNEY HATCHERY GROUNDS TO BE IMPROVED.

Mr. John McLaren, the well-known landscape gardener of Golden Gate Park, San Francisco, recently made a visit to the Mount Whitney Hatchery for the purpose of offering suggestions as to the improvement of the grounds. The large amount of water which passes through the hatching troughs is to be utilized in beautifying the surroundings. The natural boulders, so numerous in the vicinity, will be utilized to form cascades, and shrubbery and trees will be planted to give a suitable background. Mr. McLaren gave helpful information as to the grouping and kinds of trees and shrubbery to be used.

FIREWORKS USED TO FRIGHTEN BIRDS IN RICE FIELDS.

Some experiments to determine the effectiveness of fireworks in frightening birds from rice fields have recently been made in the Sacramento Valley. The location selected was on the Gingg and Cooper ranch, four miles west of Live Oak, where birds did considerable damage last year.

In talking with Mr. Cooper in September regarding cooperation by the Fish and Game Commission in order to find a remedy, and knowing the effect of black powder, which is both loud and smoky, we suggested to him the use of some form of loud explosive that would carry fire and smoke. We secured several samples of rockets and bombs from San Francisco and commenced the experiment by setting some of them off after dark. However, the birds were still numerous on the rice fields at daylight in the morning. We then fired more bombs and still more while the birds were in the air. To say that the ducks were demoralized does not convey an idea of how much they were frightened.

Mr. Cooper was so impressed with the effectiveness of the bombs that he sent for four dozen of the kind selected, at five dollars per dozen. After using half of this number night and morning there was not a bird of any kind to be found on his fields. In a few days some mudhens and ducks returned, presumably new ones. He then used the balance of the four dozen effectively, and sent for five dozen more for emergency use. On September 26 Mr. Cooper stated to us that he had had no occasion to use or open the last five dozen, as at that time there was not a bird on his fields and he had not suffered a particle of injury. Judging from this, the experiment may be said to have been a success.

Conditions on Mr. Cooper's fields made it harder to protect them from the birds than any other fields in the district, the water being deeper in spots, which induces the birds to congregate there. Of course, when the birds were driven from the Gingg and Cooper grounds, some of the other growers certainly suffered from the addition of these birds. This only demonstrates that entire relief for all growers can only be had through the cooperation of all the growers. Each can protect his fields, but the one who does not will be the greatest sufferer.

We are certain that the experiment referred to above is the only logical remedy, although many other methods have been suggested. Some rice growers, and many who are not growers (and, by the way, the last named class is the loudest in its complaints) have advocated an earlier open season for ducks. This positively will not remedy the situation. It might, if every one would kill blackbirds and mudhens, as well as ducks, but they want to kill ducks only, as the other birds are not considered good eating. So by killing ducks only, the worst menace would still remain. Again: The rice grower will not permit trespassing on his fields, as the hunter will do more damage at this time than the birds. Many of the rice farms are posted with signs prohibiting shooting and trespassing. Further, if the season was opened earlier than at present, a large number

of club members would be out shooting at the club grounds, which are not on the rice fields, but on open water and tule marsh lands adjacent thereto. Thus the ducks would be driven from the club and open shooting grounds back to the rice fields, where the rice farmer does not permit trespassing while the rice is growing. Consequently, the club members would be the only ones benefited by an early season, while the rice would suffer more than at present.

Before night shooting was prohibited, and before the use of smokeless powder, some of the best duck shooting ponds have been spoiled by shooting after dark and by using black powder. Any duck hunter of long experience can testify to this. Ducks will not return to a pond that has been shot on at night. The idea of using bombs came from this experiment. Smokeless powder is used in fixed ammunition because it does not frighten game, for it makes very little noise and smoke. The use of smokeless powder to scare ducks is money wasted. This form of ammunition is made to kill, not to frighten, but it has been used by the rice grower and he receives no relief except from the bird he kills.

Although the experiments above outlined were tried on a limited area only, they demonstrated that there is a feasible method of protecting crops from the depredations of birds.

We are sure that if the rice growers themselves will cooperate, a plan of defense can be worked out as suggested, which will make it unnecessary to threaten the extermination of the wild duck without obtaining relief from the other birds which are the worse menace. But the growers should eliminate the voice of the man who is not a rice farmer, and who only takes up the cry for the purpose of slaughter. He does not kill mudhens or blackbirds, because he does not eat them and cannot sell them.—GEORGE NEALE.

BLACK BEAR WORTH PROTECTING.

The recently enacted "bear law" was one of the best measures the Fish and Game Commission has ever succeeded in placing before the state legislature. It will effectually put a stop to the ruthless slaughter of these animals at a time when they are utterly valueless. I have heard owners of two-bit "bear hounds" boast of having killed as high as forty bears in one summer in order not to "spoil" the pro-German dachshunds who had treed them. One bear is of more value to the community than a dozen of these worthless sausage hounds, who make the night hideous with their fiendish howls, as they chase the does and fawns up and down the mountainside.

To the average mountaineer bear meat is preferable to venison. To mention bear meat in their presence is to cause a sensation similar to that produced by the mention of "sweet 'taters an' 'possum" in the presence of the congregation at a colored camp meeting.

The meat, lard, and pelt of a three-hundred pound bear in prime condition represents an actual value of over thirty-five dollars. In addition to this, outside hunters whose love of bear hunting attracts them to the mountain regions doubtless spend in transportation, license, food supplies and indicentals, an actual value of over one hundred and thirty dollars to the community. The small amount of damage done by an occasional "hog killer" is greatly offset by his value as an asset to the state, and as a source of food supply to the residents of the districts he frequents. The lard and oil extracted from a bear in good condition sometimes amounts to as high as fifteen gallons, but five gallons is probably the general average. This lard and oil, if used for culinary purposes, will prove very acceptable to the delicate stomachs of those afflicted with dyspepsia or other stomach ailments.

During the open season there will undoubtedly be many hunters who will kill bear for the pelt alone, and the meat will be left as food for coyotes. At any time and more particularly at the present time, when it is our duty to conserve the nation's food supply, it is a crime to allow this meat to become a total waste, and we sincerely hope that immediate steps will be taken to prevent it.—FRANK B. HOFFMAN.

A WAY TO CURB HUNTING ACCIDENTS.

In looking over a list of the hunting accidents for 1916, it occurred to us that some method should be devised whereby these could be curtailed.

How would it be to require answers to a printed list of questions to be furnished to all parties applying for hunting licenses—a sort of examination; for instance:

1. In getting through a fence, how would you handle your gun?

2. While riding in an auto or other vehicle, would you have your gun loaded or empty?

3. Would you ever, under any circumstances, get into a boat or vehicle with a loaded gun?

4. Would you ever point an empty gun at another person?

5. Would you ever permit any part of your person in front of the muzzle of your gun?

6. If hunting in brush or thicket, would you shoot if you saw a movement of the brush?

It seems to us if all applicants were given a good quiz along this line, it would save many lives and limbs.—O. S. Phillips.

HUNTING ACCIDENTS.

Out of forty-eight fatal hunting accidents last fall in Illinois, Indiana, Iowa, Michigan and Wisconsin, recorded in the Chicago *Tribune*, twenty-two occurred in Michigan as against only six in Wisconsin. The reason for the disparity is simple; bucks only might be killed by deer hunters in Wisconsin, but in Michigan they did not have to wait to see the horns.—*Recreation*, November, 1917.

FAWN SUCCESSFULLY REARED.

On July 8, 1917, Mr. George C. Walker discovered a dead and partly devoured doe in the vicinity of Squaw Valley. Nearby lay a baby fawn about a week old, in a starving condition. Mr. Walker immediately took care of the fawn and carried it to his home at Illikee, on the banks of the Truckee River, where he carefully fed it on a bottle, and in less than thirty days the fawn was able to be up and around.

Mr. Walker applied for and received permission from the Fish and Game Commission to keep the fawn, which was duly christened Tillicum (in the Indian language "Good Luck"). Mr. Walker's airedale dog and the fawn became great pals, and the two roamed the hills at large, always returning, however, for meals. In a short space of time the fawn became such a pet that at times it was almost a nuisance (see fig. 30).

Fig. 30. Orphaned fawn successfully reared on a bottle. The airedale dogs are good friends of the fawn. Photograph by Geo. C. Walker.

When Mr. Walker returned to his winter residence in Oakland about the last of September, he shipped the fawn down there, where it has attracted considerable public attention, especially because of its tameness.—Joseph H. Sanders.

FACTS OF CURRENT INTEREST.

The season's record albacore taken at Avalon, Catalina Island, November 13, 1917, weighed 54½ pounds and took 27 minutes to land on light tackle. The second largest albacore for the season weighed 41 pounds.

Fishermen in southern California have been on a strike, demanding $18 a ton for sardines, instead of $12 as formerly.

Ducks appear to be more numerous in the Sacramento Valley this year than for several years past.

On Thursday, November 1, 1917, fishermen at San Francisco secured the largest catch of flat fish (sandabs, sole) ever made at this port—2,000 boxes, or approximately 770 tons.

Crab fishermen of San Francisco report that crabs are unusually abundant and that they could easily exceed their contract, which calls for 600 dozen per day.

The deer season was a great success. There were apparently just as many, if not more, hunters in the field, despite the draft.

Quail have been abundant and hunters have reported good bags almost everywhere.

Schools of mackerel have been abundant along the Southern coast during the past few months, and pier anglers have enjoyed rare sport. Large net hauls have been made off the Long Wharf, Santa Monica.

The Long Beach Tuna Canning Company is planning to make a business of putting up whale meat.

The reported kill of deer in California during 1916 was 8,117. Altogether, probably not less than 12,000 deer were killed, furnishing somewhere near 450 tons of fresh meat.

Duck clubs in California have been "Hooverizing" by either stopping the baiting of ponds entirely, or by using screenings and other waste foods.

That good deer hunting is to be had in California is evidenced by the fact that, of a party of nine, hunting near Cloverdale, Sonoma County, on the opening day of the season, each obtained a buck.

FAIR PLAY.

(A page of criticisms and answers.)

MISDIRECTED PURPOSES OF GAME CONSERVATION.

Editor The Chronicle—Sir: I have been reading with a great deal of interest certain editorials appearing in the several daily papers relative to the action of the California Fish and Game Commission and the operation of the laws governing them in the discharging of their duties. I have been an ardent sportsman in the past and still hold a marked interest in both fishing and hunting. I commend the intention of the laws that are for the preservation of both fish and game. However, in the last few years things have come to such a pass that the liberty of the individual has materially lessened until the favored few derive all the benefits from the present laws. Most of my fishing and hunting have been done in the mountain counties of Siskiyou, Trinity and Shasta, particularly in Siskiyou, and I believe I know the needs and desires of the people in the last named county pertaining to fish and game. In this article I wish to bring before the public the conditions under which the law operates and the injustice of its operation. Until the last session of the legislature the open season for trout with hook and line was from May 1 until December 31. Satisfactory to all the fair-minded fishermen. Without the consent or wishes of the people, the law was changed to April 1 to November 1. By that method they have deprived the fishermen of two months' fishing. The steelhead trout does not begin to run in any numbers in the Shasta River until November 1, and this year the run was almost absent on account of the low water and lack of rain. The big run does not come until after the first big rain. Shasta River has always been a wonderful stream for steelhead during the months of November and December, and many people and especially the poor people use this particular fish for food, depending in part upon it for their food supply during the winter months. This year they are deprived by law and the activities of the Fish and Game Commission from securing even a portion of their usual supply. None of these fish are used for commercial purposes. No one makes a business of shipping or selling, and none is wasted. It seems to the majority of the fishermen and the people in general a very unjust discrimination, particularly when they allow fishing with hook and line in all the coast streams. During a time as at the present when food conservation is such a vital issue, it seems as though some means might be obtained to correct this state of affairs whereby those desiring to take fish for personal use would be allowed to do so to a limited degree during the present season when they could be taken at their best. These fish begin to spawn in the early spring and when the legal time for taking them is at hand they are of no value as food. I brought this matter up with one of the members of the commission a day or two ago, but was informed that the law would be enforced to the letter and all persons caught with trout in their possession would be severely dealt with. It will be a favor to the people in this particular district if you will publish this letter, showing the attitude of the Fish and Game Commission. Some method should be devised to correct such an unfair and unpopular law. N. A. Hawkins.

Yreka, November 12, 1917.

—S. F. *Chronicle*, Nov. 27, 1917.

AN ANSWER.

November 23, 1917.

Mr. N. A. Hawkins, Yreka, Cal.

Dear Nort: After our friendly chat several days ago regarding fishing conditions in Shasta and Siskiyou counties, I was very much surprised and rather hurt to read in the San Francisco *Chronicle* your letter criticising the work of the commission, and making statements regarding the fishing laws, which, coming from you, were a great surprise to me.

Before writing such an article you should have looked up not only the present laws, but the past.

First: You claim that the favored few derive all the benefits from the present laws. Such a statement is absurd. You have been an ardent fisherman for years

and you should know that it has been the desire of the Fish and Game Commission to suggest to legislators at Sacramento seasons to suit both the fly and bait fishermen.

Last winter, before the legislature met at Sacramento, several meetings were held, called by the commission, where suggestions were made by many sportsmen acquainted with conditions throughout the state, after which the commission prepared a bill and same was passed.

Mr. Henry Ream, your very able representative in Sacramento, went over the bill with me personally, and was more than satisfied, claiming that the people in his district wanted the season opened April 1 instead of May 1 as formerly, and that they did not care for November fishing, as it was very seldom the weather conditions would allow fishing during that month.

You personally know that it is very seldom that the Shasta River is in condition to fish with a rod during the month of November. You, in our conversation a few days ago, stated that you personally had always put up your rod in October. I know it to be a fact, as well as you, that fishing done in November or December in the Shasta River, or any other river in the northern part of the state, is not with a rod, but what fish are caught are caught with a spear or gaff.

Second: To show how unfamiliar you are with the laws governing fishing now, or in the past, you put yourself on record by stating that prior to the last session of the legislature, the season opened May 1 and closed December 31, and that this was satisfactory to all fair-minded fishermen. You are mistaken when you state the season ran to December 31. The trout season in California has never run later than November 30.

You also stated that the fishermen have been deprived of two months' fishing. During the year of 1916 and this year we had seven months' fishing, viz, from May 1 to November 30. This year the law has been changed and the 1918 season will open April 1 and close November 1. Where you can claim that the season has been cut two months I would like to know. You claim this was all done without the consent or wishes of the people.

Third: You state that the Shasta River has always been a wonderful stream for steelhead during November and December. I am well aware of this; but you certainly know, having fished the stream for years, that the stream is not fit for the rod during these months. This year on account of the lack of rain a few fish may be caught.

In the past you have always, when I met you, suggested that I should not fail to come up and visit you at Yreka and have some of your fine September steelhead fishing.

The real basis of your complaint is our enforcement of the law, rather than the law itself. Trout (steelhead), both under the present law and the former one, may only be taken with hook and line. Salmon, however, may be taken with spear, and you must know that the native along the Shasta River takes his fish in fall with the spear. In past years all fish that came to the spear were salmon, according to him. Now, that there is a deputy who enforces the law, the law is wrong.

It is all very well to bring up the excuse of the high cost of living now; but we know, and I am certain that you do, that for years these people have been in the habit of catching steelhead in the closed season and salting them down.

I will quote you the law on this subject:

> "Every person who takes, catches, kills or has in his possession during one calendar day more than fifty trout, or ten pounds of trout and one trout, or one trout weighing ten pounds and over, is guilty of a misdemeanor."

You will find in all districts a certain class who wish the laws made to suit their own convenience, and when they can not have their own way immediately start in to criticise the Fish and Game Commission.

I believe that you will find that it is our duty to see that the fish and game laws are obeyed. We do not make the laws, but at times are requested to make suggestions regarding changes, etc., and whenever we do so, believe me, it is always for the conservation of the fish and game.

Fig. 31. The growth of antlers of a deer. This splendid series of photographs was secured by Superintendent William Dirks of the State Game Farm. d, May 3, 1917; e, June 6, 1917; f, July 6, 1917; a, August 6, 1917; b, Sept. 1, 1917 (?); c, Sept. 10, 1917.

You say in your letter you "commend the intention of the laws that are for the preservation of both fish and game." If so, would it not be well for you to assist us in our work by talking to the people in your district where, you know for years, both fish and venison have been salted down in large quantities; and do not rush into print condemning us for something that you have shown plainly you are not familiar with.

Knowing you as I do, I feel it my duty to call your attention to many misstatements in your letter published in the *Chronicle*. The public is often misled in this way and the Fish and Game Commission is unduly criticised.

Yours truly,

(Signed) E. L. Bosqui.

HATCHERY NOTES.

W. H. Shebley, Editor.

TROUT AND SALMON DISTRIBUTION FOR 1917.

On November 6, Fish Distribution Car 01 completed the distribution of the last consignment of fish from Mount Shasta Hatchery for the season of 1917, when the streams of Marin and Sonoma counties received their annual allotments of trout fry.

The season past has been one of the most successful in the history of the California Fish and Game Commission. As shown by the following table, a total of 26,386,000 trout and salmon fry were distributed. This included a shipment of 100,000 steelhead trout eggs, which were shipped from the Brookdale Hatchery to the Minnesota Game and Fish Department to be hatched and distributed in the streams of that state. This consignment of eggs was shipped in exchange for a consignment of German brown trout eggs received from the Minnesota Commission during the season of 1916.

Trout and Salmon Distributed in 1917.

Mt. Shasta—	
Rainbow	3,073,500
Eastern brook	1,613,500
Loch Leven	1,500,000
Black-spotted	987,000
Steelhead	3,000,000
Total trout	10,174,000
Salmon	6,862,000
Mt. Whitney—	
Rainbow	300,000
Black-spotted	250,000
Steelhead	700,000
Total trout	1,250,000
Tahoe—	
Rainbow	241,000
Black-spotted	763,000
Total trout	1,004,000
Tallac—	
Black-spotted	1,946,000
Fort Seward—	
Rainbow	140,000
Steelhead	1,322,000
Total trout	1,462,000
Salmon	491,000
Almanor—	
Rainbow	355,000
Domingo Springs—	
Rainbow	126,000

Brookdale—	
Steelhead	980,000
Ukiah—	
Steelhead	445,000
Snow Mountain—	
Steelhead	202,000
Bear Lake—	
Rainbow	874,000
Wawona—	
Rainbow	147,000
Steelhead	68,000
Total trout	215,000
Total trout	19,033,000
Total salmon	7,353,000
Grand total	26,386,000

Immediately upon the completion of the distribution of fish from the different hatcheries, preparations were commenced for the coming season's operations.

The usual work of repairing and painting the hatching troughs and buildings at the Mount Shasta Hatchery is well under way, and the ponds and grounds have received their annual overhauling.

Eastern brook and Loch Leven egg collecting operations were commenced during the latter part of October, and to date 1,271,000 Eastern brook and 1,748,000 Loch Leven eggs have been taken.

Arrangements are being made to ship 75,000 Loch Leven trout eggs to the new Mount Whitney Hatchery in Inyo County from Mount Shasta Hatchery as soon as they can be safely packed and shipped. The Loch Leven eggs, together with 100,000 of the Eastern brook trout eggs, which have been ordered from one of the Eastern hatcheries, will be hatched at the Mount Whitney Hatchery and distributed in the streams of southern California.

Following the plans for bringing up the fishing to the trout rearing capacity of Bear Lake, a crew of experts has been busy taking advantage of the fine fall weather to install 30 troughs, together with the necessary flumes, fishways, live cars, covering frames, etc., as well as constructing a temporary tent house to shelter them while the negotiations for the necessary long-term lease with the North Estate are being concluded, when a permanent structure will be built.

The Bear Lake Egg Collecting Station on North Creek will have a capacity of 6,000,000 eggs. The lake is now six feet lower than last year. A normal rainfall will raise it four feet, in which event the sexually mature trout will again come to North Creek to spawn; but should the

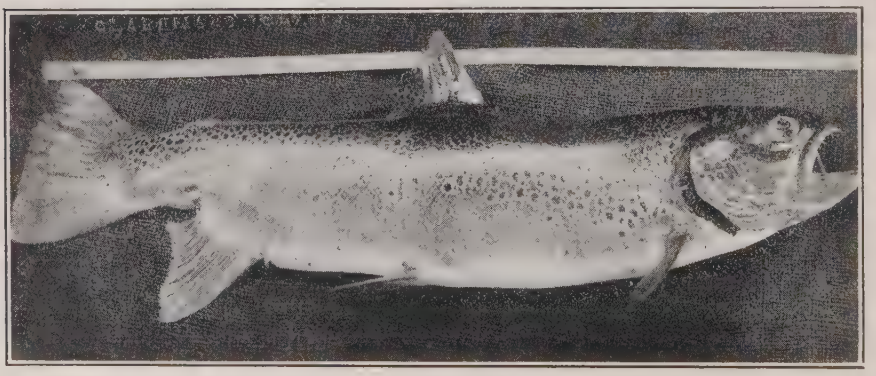

Fig. 32. A seven and one-half pound Lock Leven trout caught by Mr. A. Lunde in September, 1917, in Big Bear Lake, San Bernardino Mountains. Photograph by W. M. Pierce.

winter be dry and lake levels remain low, the spawners will scatter to the mouths of the other creeks and deposit their eggs, decreasing greatly the egg-taking opportunities of the "strippers" at North Creek. All preliminary arrangements have been completed at this station, and everything is now in readiness for the commencement of egg collecting operations as early in the spring as it is possible for the crew to get in through the desert pass.

Tahoe Hatchery has been shut down for the winter, and a ten years' lease has been secured from Mrs. Anita Baldwin on Tallac Hatchery, which is unique as the only available place for collecting and hatching the eggs of the black-spotted trout.

The Commission is also negotiating for the purchase of three acres of the Frank X. Walker property, near Tahoe City, which includes three natural springs. It is planned to abandon the old Tahoe City Hatchery, and erect a modern hatchery with a capacity of three to four million trout.

Plans to improve Wawona Hatchery are pending. We are waiting for a lease from the Wawona Hotel Company, who have promised us all that we have requested in the shape of land and water rights.

Almanor and Domingo Springs hatcheries were closed during the latter part of September, after being put in readiness for the spring egg collecting operations, which will probably be commenced during the fore part of March.

Salmon egg collecting operations at Bryans Rest on Eel River, Humboldt County, have not proved a success. After a two-foot rise in the river, a few salmon reached the racks, and 350,000 eggs were taken. The opinion of our assistants in charge of the operations is that the market fishermen were catching nearly all of the fish in the lower reaches of the river. The racks, traps, etc., were carried out by the flood waters following the last storm, but fortunately practically all of the material was saved, and can be used for future operations.

The Fort Seward Hatchery has been given a thorough overhauling and is in excellent condition for next season's operations. The salmon eggs taken at the Bryans Rest Station will be hatched and reared at Fort Seward Hatchery, and distributed at the proper time in the tributaries of Eel River.

Ukiah Hatchery and Snow Mountain Egg Collecting Station will be repaired during the month of December. The fishway and trap on the Snow Mountain Dam were damaged by the water last season, and must be repaired before the steelhead trout begin to run.

A few minor repairs are necessary at the Brookdale Hatchery, and this work will be completed during the month of December.

Scott Creek Egg Collecting Station is in readiness for the season's operations.

A HATCHERY FOR YOSEMITE VALLEY.

If negotiations now pending with the Department of the Interior relative to a water supply and site are successful, it is proposed to erect a suitable hatchery in the Yosemite Valley this coming season. The ever-increasing number of visitors and pleasure seekers to this wonderful section, and its easy access by automobile, has made it necessary to heavily stock the streams and lakes of this region. The long distance that the fish have to be carried from Mount Shasta or the Mount Whitney hatcheries to the Yosemite region does not meet the demand, as the number that can be shipped so great a distance is limited. It will be a better policy and more economical to hatch and rear the fish in the Yosemite Valley, where they can be distributed by the park service. In addition, a hatchery in the Yosemite would be of great educational value as it would be visited by most of the 30,000 persons who visit the valley annually.

INSECT FOOD FOR TROUT INTRODUCED.

A most important work has been undertaken by the Fishcultural Department in the collecting and distributing of aquatic insects upon which trout feed, *Cordyalis* larvae being taken from the Klamath River to streams tributary to Lake Tahoe, and 500,000 of the valuable *Gammarus*, or fresh water shrimp, being brought from the state of Nevada to plant in Tahoe and Donner lakes. The planting of suitable food should keep pace with the distribution of young fish,

carrying this idea even to the introduction of aquatic plants upon which such insect life can multiply. Many Sierra lakes, otherwise ideal, are barren of fish because they produce no feed, and must first be built up to support fish life, after which trout can be established in a very short time. It is the plan of the Department of Fishculture to begin systematic operations, on a large scale, to introduce aquatic plants and insects in the barren waters of the more important lakes in the high Sierras during the coming season. This work must be done by persons familiar with the habits of the insects and fish as well as the conditions that prevail in the lakes that are to be stocked. As soon as the insects are introduced and are thriving, the lakes will be stocked with trout fry.

SUCCESSFUL INTRODUCTION OF SALMON IN NEW ZEALAND.

The Fishcultural Department has received a letter from the Honorable L. F. Ayson, Chief Inspector of Fisheries for New Zealand, that will be of interest to all fishculturists interested in the propagation of salmon. It also puts some new light on the "parent stream theory" regarding the habits of the salmon. Evidently the salmon have not confined themselves to the stream in which they were planted in New Zealand. The efforts of the New Zealand Government to establish a run of salmon in New Zealand began in 1873, when the first salmon eggs were shipped from California to New Zealand. At different times from 1873 to 1900, shipments of salmon eggs were made to New Zealand, but no results were obtained. In 1900, G. H. Lambson, then Superintendent of Baird Hatchery on the McCloud River, took a consignment of salmon eggs from McCloud River, California, at the request of Honorable L. F. Ayson, Inspector of Fisheries, to New Zealand. Mr. Lambson personally attended to the collection and preparation of these eggs, and cared for them en route, and on their arrival in New Zealand, arranged for the hatching and rearing of the fry. From this and subsequent lots taken by Mr. Lambson, dates the introduction of the quinnat salmon into waters of New Zealand. Following is an extract from the letter of Mr. Ayson regarding the salmon in New Zealand:

"W. H. SHEBLEY,
Dept. of Fishculture,
San Francisco.

DEAR MR. SHEBLEY: I was very pleased indeed to get your letter of the 7th February, and also the copy of your biennial report, which you kindly sent. The report contained a great amount of most interesting and useful information. There is no mistake about your fish culture work progressing and on modern lines.

With regard to the spread of salmon along our coasts, the Waitaki is the only river on the east coast of the South Island in which salmon have been planted, and now they have spread from there into five rivers north along the coast, for a distance of fully three hundred miles, and south from the Waitaki for a distance of about 120 miles. There is a strong ocean current running from south to north along that coast which no doubt accounts for the salmon traveling further north than they have done south.

The first river suitable for salmon is the Rangatata about ninety miles north of the Waitaki, and they made their appearance there five years after the first fish were taken in the spawning season, in a tributary of the Waitaki, and now nearly as many run into the river as into the Waitaki. In each of these rivers over three tons of salmon were caught by trout anglers in five weeks last autumn. In New Zealand, at any rate, salmon have of their own accord spread along the coast and ascended and spawned in rivers where no salmon have been planted.

In this country the trout fishing is controlled by Acclimatisation Societies, and as the salmon come in, in the autumn, when the run of trout is over, anglers have had splendid sport catching these fish with spinning bait after the trout fishing is finished. This has considerably increased the number of anglers, and the Societies' revenue from angling licenses, and they are now making a big bid to get the control of the salmon. This, of course, I am strongly opposed to for reasons—(a) that the State found all the money and did all the work of introducing these fish, (b) that the Societies at first opposed the introduction of this salmon because they said "it was no sport fish and not desirable fish to introduce," and (c) that the Societies' administration and fish cultural methods are wasteful, inefficient and not to the best interests of the majority of our people.

Yours very sincerely,
L. F. AYSON,
Chief Inspector of Fisheries."

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

OUTPUT OF CALIFORNIA'S FISHERIES DOUBLED.

An appeal has gone out from the government, through the Food Administrator, urging that all kinds of food production be speeded up. It has been especially desired that the production of the fisheries be increased in order that the more concentrated meats may be released for shipment to Europe. No other state has responded as has California. The catch of fish during the year just passed is double that of the previous year. The large take of sardines and herring during the closing months of the year is certain to send the year's catch above the two hundred million pound mark. This increase has been accomplished without suspending fishing regulations and restrictions. In most of our seacoast states there has been a decreased catch of fish during the last year, which in some cases was due to the use of the larger fishing vessels for other purposes, while in other cases it was due to impoverishment of the fish supply. This impoverishment is most striking in the case of halibut and salmon along our north Pacific Coast and Alaska as well as British Columbia. The companies operating in this region are not asking that all fishing restrictions be removed for they have at last awakened to the fact that the halibut and salmon supply is not inexhaustible and that the present restrictions are inadequate to safeguard the future and keep these fisheries up to their full capacity. After years of indifference as to the future, they are now "demanding" conservation.

Although the fisheries of California have done so well in the present crisis, we should be able to increase their production very greatly during this coming year. We should not lose sight of the fact that nearly all of our fishery products are used outside of the state and that a large part is even sent outside of the United States.

The people of the Nation are being urged by the Food Administrator to use foods that are near at hand in order to relieve our congested railroads. It is a patriotic duty, therefore, for the people of this state to use more of our fish which are here in such quantities close at hand.

Such a small quantity of fish is used locally by the people that the fresh fish dealers are unable to sell at a low price. Experience has taught these dealers that reducing the price does not result in a corresponding increase in consumption and that their business can be made to pay only by charging a relatively high price. With the great expense that is required to furnish a small amount of fish on but one day a week, it is a wonder that the price is as low as it is. The butchers are complaining that the meatless Tuesday so increases their overhead expense that their business is not profitable and that they will have to raise prices. Fresh fish dealers have been struggling along with six fishless days a week. If people would use fish on each day of the week as they do meats, fish stalls would increase in number, competition would develop, marketing and transportation conditions would improve and fish would become our cheapest article of food.

THE SALMON CATCH ON EEL RIVER.

The Eel River salmon season opened on October 8 with several companies competing for the fish and nearly 150 boats with gill nets fishing in the lower five miles of the river. The first night's catch was nearly 200,000 pounds, and then for several days very few were caught. The stream is usually low at this season and the salmon congregate in the pools in the lower river for two or three weeks before the opening of the season. As it has been claimed that a great many steelhead are taken at the first of the season, a sharp lookout was kept for these fish, but only seven were taken the first night. The season closed on December 7 with a rather poor season's catch. The river remained very low until just before the close when a rain brought a four foot rise. It came too late, however, to start the fish before the closing day. That the diminished catch was due to late runs and not to a depleted fish supply, is borne out by the fact that the silverside

salmon which usually appear by the first of November and reach their height about December 1, did not put in their appearance until a few days before the end of November. Steelhead were also late and less than 10,000 pounds were taken which is about one-third of the amount taken last year. The fishermen are endeavoring to get the river opened again during the month of January, arguing that the river can furnish 100,000 pounds of steelhead during that month without injury to the steelhead supply. Fishermen on Smith River, Del Norte County, claim the same for that river.

SEA FOOD WASTED.

Recently nine hundred pounds of fish were sent from San Diego, California, to El Paso, Texas, to be used by the people of that city on Friday, the day which has been inherited as fish day. The shipment arrived too late for Friday's market and as the next Friday was too far off, the lot went to the city disposal plant after waiting three days for buyers who were willing to take a chance at them on a day other than Friday. The El Pasons did not see the humor of it, but berated the express companies for causing a waste of food in these war times.

NO FIXED PRICE ON SALMON.

At the request of the State Market Director, the fishermen, dealers, canners and others interested in salmon, met at his office on December 6 to discuss the matter of fixing the price of fresh salmon this winter. Detailed figures were presented by the Monterey Bay and Sacramento River fishermen, which showed that at any price the market is likely to pay, the fishermen will not make expenses during the winter or off season, which extends from November to April. Under the circumstances, the Market Director determined it would be unjust to fix the price at this time.

KELP HARVEST FOR 1917.

The amount of kelp harvested on the coast of California during 1917 was 398,898 tons. From this kelp was produced 6,000 tons of potash (K_2O) with a value of $2,100,000.00. Other products are being produced from the kelp, such as acetone, several esters, chetones, sodium alginate, and potassium iodide.

LIFE HISTORY NOTES.

DUCKS DIE AT SALTON SEA.

From about August 15 to the last of October, 1917, large numbers of ducks and other water birds died at Salton Sea, in the Imperial Valley. In the early part of October pintail ducks died by the hundreds and formed a windrow along the shore. I counted forty dead bluebills and fifteen canvasbacks in a distance of fifty rods along the shore of the lake on October 14. The birds lose the use of their legs and then of their wings, and finally are absolutely helpless. After developing these symptoms they are certain to die in from one to four days.

Although cormorants and white pelicans are numerous, they do not appear to be subject to the disease. Geese also, though abundant, do not seem to be affected.

Several persons have eaten the meat of the diseased ducks with no ill effects, and cats feeding upon the dead birds show no symptoms of poisoning.

All evidence points to the view that this is the same sort of disease that has appeared at Tulare and Buena Vista lakes in California and at Great Salt Lake in Utah.

Apparently ducks affected with the disease are benefited with a change to fresh water. My man and I have picked up a great number of birds so affected and have placed them on sandbars at the mouth of the river. Here they appear to do better, but most died or were eaten by coyotes, which are plentiful here.—CHARLES E. DAVIS.

CANADA GEESE BRED IN ALAMEDA COUNTY.

Six or seven years ago I bought six Canada geese (*Branta canadensis canadensis*) at Hawthorne, Esmeraldo

Fig. 33. Shore of Salton Sea showing numerous ducks which have died from a peculiar disease. Each of the black spots in the photograph represents a dead duck. Photograph by J. K. Heath.

County, Nevada. They were caught in Walker Lake with a net, during the molting season, and were placed inside a wire enclosure at my place near Alvarado, Alameda County, California, along with some black swans. The swans immediately attacked the geese, killed one of them and injured another so that it died soon afterwards. Of the four geese that were left, one was a female and the other three males. About a year ago last August the female escaped by rising on a high wind, but returned to me two or three months later, joining the other three geese.

The enclosure in which they are kept has a little artificial lake about 150 feet in diameter, with an island in the center about fifteen feet in diameter. Last Spring (1917) my caretaker observed the female trying to make a nest on this little island. He accordingly gathered some grass, weeds, etc., and placed them on the island, with the result that the goose laid six eggs, five of which hatched, and four of the goslings are now fully grown, making eight geese altogether.

This appears to be the first instance of wild Canada geese being bred at lower elevations.—F. M. Smith.

WHITE DEER IN TRINITY COUNTY.

Hardly a season passes that a white or cream-colored deer is not reported as having been seen in Trinity County. Nor are these reports unfounded, for there are many well authenticated instances and several skins are in existence. The Indians of the Hoopa Reservation have long utilized white deer skins in one of their religious ceremonies and at least one skin procured in late years has become the property of an Indian on the reservation. I saw a white deer many years ago on the upper Hayfork River. This animal was later shot by the Shock Brothers of Hayfork, who report that they have killed two other white deer. Albinos have been seen by eight different people whose names I have in my possession. A few years ago George Grieg of Junction City killed a white spiked buck. He was arrested, fined twenty-five dollars and the confiscated skin was sent to the Fish and Game Commission. The most recent report of a white deer is of one seen by Henry Morris and Charles Knowles in May, 1917, on Redding Creek, near Junction City.

In my opinion white deer should be protected by law, because of their rarity and unusual interest. Owing to the greater value of the skin, there is increased incentive to kill such animals, and consequently danger of exterminating them.—G. O. Laws.

REPORTS.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1917.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Imperial	Total
Albacore										482	10 904,452	190	4,901,579		25,689,255
Anchovy							87,525		97.795		33,759				219,079
Barracuda									5,657	37,367	300,793	12,718	169,926		526,464
Bonito								2,127		4,448	102,798		15,506		124,879
Bocaccio		190				50	4,938	12 525	58.707						76,410
Bluefish							145,361	2,645	6 214						154.220
Chilipepper							128,710	50,480	8,093						187,283
Carp				968	6,610	4,845	15,888		8		15,807				44,126
Catfish		50		1,420	2,797	4.044	994								9,305
Coalfish		462					296.201	25,018	220		992				322,893
Cultus cod	827	30,476	125			420	141.936	9,486	12,513		42				195,823
Dogfish		3,150	6,465			50	5,936				7,887		8,462		31,950
Flounder	413					75	222,657	7,700	120						230,965
Halibut	14,285	80,025					11.696	3,108	21,316	24,903	47,917	11,908	774,744		989,902
Hake							23,284	16,555		275	8,335		235		48,714
Herring										520	760				1,280
Kingfish							51,814	7,541	49.975	308	25,641		2,626		137.905
Mackerel								66	265,764	10,181	712,106	5,718	74.078		1,067,913
Mullet														8,946	8,946
Pike				4	195	395	1,908								11,418
Pompano							15	530	54	68	2,131		211		3,009
Perch	3,842		1,278			8	58,856	1,375		275	1,481				67,115
Rock bass	3,750									478	85.879	5,278	99,667		195,052
Rockfish		1,826	202			30	231,833	244.099	211,418	10.033	398,654	584	136,995		1,235,697
Sole		34				187	1.915,040	1,113,779	9,304	13,553	211				3,052.108
Salmon	246 257	367,229	36,792	2,873,454	721,635	982,396	1.215,042	16,958	456,713		1,510				6,928,016
Smelt	2,014		12,457			257	98,276	58.860	79,068	11,269	14,022	17.834	9.398		303,654
Sea bass (white)			5,074			263	854	873	3,955	2,405	107,085	2,391	176,596		299,496

Sea bass (black)									150	305	4,979		15,606		21,040
Sandab							462,099	234,155	5,060		4,057	75			705,446
Striped bass			13,483	21,144	29,458	44,089	79,021	92							187,287
Shad				7,262	33,480	12,989	4,779		1,792				114		60,416
Sturgeon					125		125								250
Sardine							26,835	1,370	16,560,483		3,970,527		2,067,962		22,557,177
Skate							61,636				85				61,751
Sculpin							150		29		1,112				1,291
Sea trout											371				371
Tom cod							4,452				560				5,012
Trout (lake)											75				75
Trout (steelhead)	1,530					12									1,542
Turbot		17	430							26					473
Whitebait			125				69,482								69,607
Yellowtail								3,477	11,311		355,524	200	1,103 541		1,477 053
Miscellaneous		16,451		100	120	406	59,615	875			23,477		9,534		110,578
Total fish	272,918	499,910	76,431	2,904,352	804,450	1,050,486	5,379,140	1,812,558	17,805,719	116,896	27,133,662	56,896	9,567,108	8,946	67,540,321
Crustaceans—															
Crab (dozen)	54,664						145,542	5,220							205,426
Spiny lobster											1,330	29,374	45,150		75,854
Shrimp							218,705								218,705
Total															499,985
Mollusks—															
Squid									114,730						114,730
Cuttlefish			58				2,385	3,449	1,582						7,474
Clam (Pismo)										113,485	1,070				114,555
Clam (cockle)		751	21,261								5,760				27,772
Clam (softshell)		865				8,830	13,950								23,675
Clam (mixed)	11,430	52	26,461			4,930	15,470	500			2,550				61,393
Oysters (native)							7,230								7,230
Oyster (shell)			42				608,350								608,392
Abalones		6,358							265,960	1,692					274,010
Mussels	1,400	1,951				399	18,919		384		875				23,928
Total															1,233,159

VIOLATIONS OF FISH AND GAME LAWS.

June 1 to October 31, 1917, Inclusive.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without license	74	$1,125 00
Failure to produce license on demand	2	
Deer, close season, killing or possession spike-buck	40	1,525 00
Deer horns and skins—failure to produce	8	175 00
Female deer and fawns—killing or possession	16	600 00
Illegal deer hides	4	140 00
Deer not properly tagged (close district)	2	30 00
Quail, close season, killing or possession	16	395 00
Ducks, close season, killing or possession	55	1,290 00
Doves, close season, killing or possession	15	380 00
Cottontails, close season, killing or possession	16	350 00
Brush rabbits, close season, killing or possession	3	25 00
Nongame birds, close season, killing or possession	3	35 00
Fur-bearing mammals, close season, killing or possession	3	25 00
Shore-birds, close season, killing or possession	14	125 00
Sage-hens, close season, killing or possession	3	75 00
Cranes, close season, killing or possession	1	25 00
Grouse, close season, killing or possession	1	5 00
Night shooting, close season, killing or possession	11	175 00
Total game violations	287	$6,500 00
Fish.		
Angling without license	23	$420 00
Fake statement on application	3	30 00
Fishing for profit without license	13	205 00
Trout, close season, taking or possession	1	5 00
Trout, sale undersized	1	20 00
Trout, taking other than with hook and line	6	170 00
Trout, excess bag limit	3	55 00
Catfish, offering for sale undersized	2	170 00
Barracuda, offering for sale underweight	1	20 00
Spot-fin croaker, offering for sale, close season	1	25 00
Sacramento perch, excess limit	1	100 00
Black bass, close season, possession undersized	3	70 00
Striped bass, close season, sale, possession, underweight	9	40 00
Salmon, close season, taking or possession	6	200 00
Crabs, close season, taking or possession Crabs, female, undersized	7	20 00
Abalones, close season, taking or possession, undersized	6	95 00
Clams, undersized, excess bag limit	14	267 50
Dried California shrimp in possession	3	1,020 00
Dynamiting fish	2	200 00
Illegal nets	8	50 00
Fishing within two-mile limit	1	
Total fish violations	114	$3,182 50
Grand total fish and game violations	401	$9,682 50

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

June 1 to October 31, 1917, Inclusive.

Game.

Ducks	862	
Quail	52	
Doves	99	
Geese	9	
Cottontails	13	
Brush rabbits	19	
Grouse	2	
Sage-hen	5	
Crane	1	
Shore birds	71	
Deer meat	934½	pounds
Deer hides	4	
Bear hides	1	

Fish.

Trout	477½	pounds
Salmon	4,045	pounds
Striped bass	588½	pounds
Barracuda	2,200	pounds
Sturgeon	115	pounds
Spot-fin croakers	1,726	pounds
Catfish	26½	pounds
Crabs	1,385	
Abalones	46	
Clams	1,385	
Clams	127½	pounds
Lobsters	125	pounds
Dried shrimp	6,500	pounds
Nets, traps and fishing outfits	11	

Searches.

Illegal fish and game	25

STATEMENT OF EXPENDITURES FOR THE MONTHS OF MAY, JUNE, JULY, AUGUST AND SEPTEMBER, 1917.

	May	June	July	August	September
General Administration.					
General administration	$2,036 97	$1,796 32	$2,321 85	$1,815 45	$1,954 02
Research publicity and educational (game)	249 54	220 48	233 92	211 53	204 63
Printing	744 01		361 94	579 32	
Fish exhibits	5 50				305 84
Game exhibits					74 99
Game farm	212 21	228 55	309 30	191 80	307 17
Mountain lion bounties	180 00	220 00	100 00	260 00	320 00
Lithographing hunting licenses		950 00			
Lithographing angling licenses					
Hunting license commission	810 70	1,475 30	1,033 20	1,001 20	2,764 80
Anglers' license commission	1,098 00	835 26	2,027 70	798 90	1,515 60
Market fish license commission	246 50	234 50	15 50	61 50	96 50
Paper Mill Creek Dam					
Totals	$5,583 43	$5,960 42	$6,078 41	$4,919 70	$8,085 55
Patrol.					
San Francisco district	$4,703 94	$5,360 68	$5,327 03	$5,445 92	$5,338 04
Sacramento district	3,642 59	3,550 27	3,927 12	3,759 33	3,745 40
Los Angeles district	2,188 90	2,080 71	2,143 51	2,165 54	2,159 19
Launch patrol	895 84	744 02	707 63	1,149 78	1,008 03
Prosecutions (fish and game)	161 00	20 00	70 60	46 00	209 05
Crawfish inspection	300 00	300 00	300 00	300 00	398 82
Winter game feeding	3 10				
Accident and death claims	155 05	124 04	200 64	200 64	305 89
Totals	$12,050 42	$12,179 72	$12,676 53	$13,067 21	$13,163 92
Department of Fish Culture.					
Hatchery administration	$801 78	$729 06	$873 25	$908 18	$760 19
Mt. Shasta Hatchery	1,427 93	2,495 66	2,230 15	1,548 36	2,641 71
Klamath Station	262 19	250 00			6 25
Mt. Whitney Hatchery	477 22	1,063 26	393 96	607 26	790 22
Rae Lakes Station		30 00	537 45	244 19	4 62
Cottonwood Station				43 50	10 00
Tahoe Hatchery	400 13	382 30	310 84	255 81	317 56
Tallac Hatchery				103 28	52 68
Markett-Carson Hatchery					
Fort Seward	428 87	550 30	505 21	420 84	474 05
Ukiah Hatchery	185 71	282 72	115 02	47 44	11 04
Snow Mountain Station	528 98	12 70			36 00
Brookdale Hatchery	208 81	230 92	230 90	111 44	114 10
Scott Creek Station	102 25	70 25	40 25	75 85	30 00
Almanor Station	452 45	594 87	370 77	10 09	25 58
Domingo Springs				445 93	299 48
Bear Lake Hatchery	394 55	783 14	294 21	233 92	101 82
Wawona Hatchery	78 10	90 00	75 00	75 00	
Yuba City Station		51 01			
Fish distribution	15 00	737 28	2,914 59	1,385 46	1,476 11
Fish transplanting	7 47		143 65		
Screen fishway and water pollution	386 91	659 95	585 74	485 14	527 33
Special field patrol					50 00
Totals	$6,160 35	$8,765 92	$9,620 99	$7,001 69	$7,729 74
Commercial Fisheries Department.					
Fishery research and patrol	$431 72	$559 93	$1,302 04	$1,109 75	$1,412 74
Department of Engineering.					
Mt. Whitney Hatchery	$207 16				
Grand totals	$24,433 08	$27,465 99	$29,677 97	$26,098 35	$30,391 95